

A National Review of State Timber Sale Programs and An Analysis of Factors Influencing Minnesota State Stumpage Prices

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Executive Summary

The recent major decline of Minnesota's timber stumpage market has raised growing concern about the policies, procedures, and contract provisions associated with Minnesota's public land timber sale programs, in particular those that apply to timber sold from state-administered forest land managed by the Minnesota Department of Natural Resources (MN DNR). In its December 2006 report, Governor Pawlenty's Task Force on the Competitiveness of Minnesota's Primary Forest Products Industry (Governor's Forest Products Task Force) identified timber sale policies and procedures as one of the most urgent economic issues facing the state's wood products industry. Specifically, the report recommended a study be undertaken to assess how state timber sale procedures and associated conditions impact stumpage prices.

This report describes several research studies undertaken to address the important information needs identified in the Governor's Task Force Report. The studies contained in this report are:

- 1) A national survey of state timber sale policies and programs to identify and describe the characteristics, policies, and programs of state timber sale programs across the country and identify opportunities to improve public timber sale design and administration.
- 2) A qualitative assessment of the perceptions and attitudes of selected state timber sale program administrators from across the US on stumpage markets and efficient public timber sale administration strategies using focus group methodology.
- 3) An econometric analysis of how contract, timber tract, and administrative factors influence stumpage prices using MN DNR timber sale records.
- 4) An empirical assessment of how buyers differentiate their willingness to pay for MN DNR stumpage when timber sale contract length and reserve prices are varied using a paired bidding experimental economics methodology.
- 5) A quantitative assessment of major influences on Minnesota stumpage prices in the Lake States as perceived by DNR foresters and purchasers of DNR stumpage in Minnesota, Wisconsin, and Michigan.

Key findings from these studies are described below.

State Timber Sale Policies and Programs

State governments play a prominent role in the management of public forests in the US. Together, states own over 63 million acres of forestland, approximately 20% of the country's public forest land base. The authority for overseeing the management of each state's state-owned forest land typically rests with its natural resource or conservation agency, often in the agency's forestry department or division. This part of the study sought to describe the characteristics, policies, and programs of state timber sale programs across the country and identify opportunities to improve public timber sale design and administration through the use of a national mail survey and three focus groups of selected timber sale administrators.

Mail Survey

A mail survey was developed and sent to the timber sale program supervisors in 46 agencies located in 43 different states that administered timber sales on state-owned forest land from 1999 to 2008. The questionnaire requested information on the physical characteristics of state-owned forest land, factors influencing program direction and goals, characteristics of the surrounding wood products industry, and methods for selling timber in each state. It also asked timber sale program supervisors to identify recent changes made to their program and gave them an opportunity to describe any perceived opportunities for program improvements. The survey was administered in spring 2009 and generated completed questionnaires from 37 different timber sale program supervisors (80% response rate). Major findings from this survey are described below.

State timber sale program variability. States administer timber sale programs that have jurisdiction over state-owned forest land bases ranging in size from 24 million acres (Alaska) to 9,000 acres (Texas). In 2008, individual programs offered as many as 1,182 individual timber tracts for sale (Minnesota), and as few as one tract (Utah). Timber sale programs oversaw annual harvesting activity on 95 acres (Utah) to 57,000 acres (Minnesota) of forest land. Most of the large state timber sale programs, defined as managing at least 750,000 acres of state-owned timberland, are located in the Lake States (Michigan, Minnesota, and Wisconsin), the Pacific Northwest (Alaska, Washington, Oregon, and Idaho), Florida, and Pennsylvania.

Sources of program direction. State timber sale programs typically receive direction from a variety of sources, including state statutes (94%), administrative codes (56%), and agency guidelines or manuals (74%). The average timber sale program is expected to meet at least four separate management goals codified in state statute. The most common state forest management goals are to protect soil quality, enhance wildlife habitat, improve water quality, and generate a sustained timber yield. Only 27% of state programs are required by state constitution or statute to generate financial returns.

Program goals. State timber sale program supervisors believe their programs are responsible for achieving a variety of important forest management goals, many of which are not explicitly identified in state statute. Improved soil quality, wildlife habitat, water quality, and sustained timber yield were cited as the most important state forest management objectives. Generating financial returns, promoting recreational opportunities, and supporting the local economy are also considered important program goals, regardless of whether they are included in state statutory language.

Competition for state timber tracts offered for sale. Competition for state timber tracts offered for sale is frequently very low. Supervisors estimated that more than one-third of state timber tracts have two bidders or less and two-thirds of tracts had less than five bidders.

Methods of selling timber. On average, 76% of state timber volume offered for sale is sold through an auction process; the remaining timber volume is sold at negotiated or advertised prices. First-price sealed bid auctions are the dominant auction method (91%) and oral, ascending-bid auctions are rarely used by state timber sale programs.

Contract length. States typically give purchasers two years or less to harvest timber tracts; 3-5 year timber sale contracts are extremely rare. Nearly 86% of stumpage volume is sold with a contract length of two years or less, and only 6% of sale contracts are longer than three years.

Appraisal methods and reserve prices. Approximately half of state timber sale programs set reserve prices equal to the appraised value of the standing timber. In other programs, reserve prices are set at a fraction of timber's appraised value, usually 50-90%. At least one state sets reserve prices equal to the cost of administering the sale. While most states utilize reserve prices, a few states do not. Several states do not advertise reserve prices, but maintain them as a means of rejecting tracts receiving only low bids.

Small business opportunities. Minnesota is the only state timber sale program with formal sale procedures used to offer timber tracts to smaller business. Several states negotiate small tracts with local contractors or make an effort to set-up small tracts specifically directed toward smaller operators.

Access and roads. The responsibility for securing access across adjacent private property to access state timber is roughly evenly split between state forestry agencies (44%) and timber tract purchasers (39%). For the remaining tracts, the state forestry agency and the tract purchaser are jointly responsible for securing access to the timber.

Payment method (lump sum vs. consumer scale). Sixty-three percent of the programs charge the purchaser a specific amount for the stumpage purchased, regardless of the volume actually harvested (i.e., lump-sum sale), while 37 of the programs charge the stumpage purchaser using a consumer scale method in which the purchaser is only charged for the volume of timber actually removed from the tract.

Recent program changes. Several state timber sale program supervisors cited various changes to their program over the past decade. These changes include:

- Modified contractual timber sale language to include more detailed language about liability and insurance coverage, log grading specifications, safety and best management practice requirements, logger training requirements, and penalties for contract violations.
- Transitioned from ascending-bid oral auctions to first-price sealed bid auctions.
- Increased timber availability for small businesses.
- Reduced capital investment requirements (e.g., down payments, bid deposits, performance bonds) at the time of purchase.
- Reduced the size of tracts offered for sale (e.g., fewer acres) or individual cutting blocks.
- Implemented or piloted a "log sort" sale program, whereby the state contracts with loggers to harvest and transport timber to a landing or a state-owned wood lot. Supervisors in these states believe the program has the potential to capture additional value for the state, as well as increase availability for smaller purchasers.
- Improved ability to track sale loads and bill stumpage purchasers for these loads through technology upgrades.
- Developed 5-year agreements in which large timber tract volumes are guaranteed. However, the specific location of tracts is only known for the first 1 to 2 years of the

contract; the location of the remaining volume to be harvested in years 3 to 5 is unknown at the time the agreement is purchased.

Opportunities to improve state timber sale programs. State timber sale program supervisors identified several changes that would improve their effectiveness or efficiency of their program. Some of the recommended changes had already been implemented in other states. Overall, the changes include:

- Improve the timber sale approval and administration (e.g., billing and accounting) process.
- Increase the use of technology used to track sale loads and bill stumpage purchasers.
- Change the capital investment requirements or performance deposits on timber sales, although states disagreed whether these requirements should increase or decrease.
- Other opportunities identified include eliminate “bad actor” loggers, negotiate sale terms and conditions on a case-by-case basis, utilize an electronic (online) bidding process, utilize Dutch auction methods, increase sealed bid auctions in areas with low competition, and hire loggers to harvest and transport wood to a landing where it is then sold by the state (i.e., log sort sales).

Program concerns. Supervisors expressed concerns over recent changes to their state programs’ timber sale contract language and approval process, stating timber sale contracts are becoming increasingly complex and the process needed to approve a state timber sale can be long and arduous.

Focus Groups

Three telephone focus groups with the supervisors of 16 state timber sale program supervisors were conducted in July 2009. One focus group contained only large timber sale programs (i.e., the state contains at least 780,000 acres of state-administered forest land) and two focus groups had supervisors of primarily medium and small state timber sale programs. Key themes that emerged from these three focus groups as summarized below.

Program Barriers

Focus group participants identified several barriers to effective timber sale program administration: (1) encouraging best practices and desirable operator performance; (2) reducing administrative costs through technological upgrades; (3) the position of the timber sale program within the state government; and (4) program responsiveness to unique and changing market conditions.

Program Opportunities

Sealed bids auctions. Most states prefer sealed bid auctions to oral auctions. Sealed bid auctions have the potential to generate greater revenue to the state and discourage exorbitant bidding behavior that exists in an oral auction bidding environment. The state timber sale supervisors who participated in our focus groups believe a sealed bid auction will generally generate fair market value for stumpage.

Procedures to reward good loggers. States rely heavily on the performance of loggers to carry out the vegetative management actions needed to manage their forest resource. High quality

loggers play an important role in states' ability to meet their forest management goals. Participants felt timber sale programs could benefit from the adoption of procedures that reward operators who display a commitment to following best management practices and meeting contract obligations, possibly in the form of bidding preference on state timber tracts. They also expressed concern about developing specific metrics by which to objectively measure logger performance.

Incentives to encourage timely harvests. State timber sale program supervisors felt timber sale contract provisions should provide loggers adequate flexibility to manage their portfolio of timber sales, yet motivate purchasers to harvest the timber within the time frame specified within the contract to allow the state to achieve their silvicultural objectives. They felt these provisions would also potentially enhance gross timber sale receipts. Charging the holders of state timber sale permits interest on the value of uncut timber is one potential means by which this could be achieved.

Improvements in technology. Opportunities exist to enhance administrative efficiencies through upgrades in technology and computer software, particularly in states with large timber sale programs. Many states have outdated technology or multiple databases that are not effectively integrated. Improvements and upgrades in this technology have the potential to reduce program administrative costs significantly.

Protected forest management accounts. Several state timber sale programs have the receipts from timber sale revenues dedicated for internal program operations. An unexpected reallocation of state timber sale revenue to nonforestry programs creates a disincentive to manage the portfolio of state lands in a manner that maximizes the program's return on its investment.

Greater flexibility to adjust sale methods to specific conditions. In some instances, mandatory timber sale procedures prevent foresters from achieving program goals. For example, greater flexibility to negotiate sale prices in areas where there is low competition for state timber and situations when emergency management is necessary could potentially increase gross revenue and improve forest health. Providing foresters and timber sale staff greater discretion may help programs generate greater revenue and achieve forest management goals more effectively.

The Impact of Contract, Tract, and Administrative Factors on Public Stumpage Prices

Econometric Analysis of MN DNR Timber Sale Data

To analyze the impact various timber tract characteristics have on public stumpage prices, we obtained an electronic database of MN DNR timber sale data. For each MN DNR timber tract, this electronic database contained information on the total appraised volume, species-product composition, tract acres, date of sale, date of sale expiration, type of tract (regular vs. intermediate), purchasing firm, and location of tract. A total of 4,395 records of MN DNR timber tracts sold 2001 to 2006 were analyzed.

A hedonic price model was developed to describe how individual timber tract characteristics influence willingness to pay for that tract. The model was able to explain approximately 63% of

the variation in stumpage prices. Specific characteristics of MN DNR timber tracts found to be significant drivers of stumpage prices are:

Species-product composition. The species-product composition of a tract offered for sale has a significant impact on stumpage prices. We found timber tracts containing a greater percentage of species that typically sell for lower prices than aspen pulpwood, such as other hardwood pulpwood, balsam fir, spruce, and pine pulpwood, decreased the average stumpage price of a tract. On the other hand, a greater proportion of more valuable species-product categories, such as bolts and sawtimber, increased the price paid for the tract of timber sold.

Location. The location of MN DNR timber tracts has a substantial impact on stumpage prices. The Orr area had the lowest stumpage prices of the MN DNR areas examined. Stumpage in Sandstone and Park Rapids areas sold for the highest prices—at least 39% more than similar tracts offered in Orr.

End-product market conditions. Strong end-product markets increase the price paid for stumpage. High end-product prices in 2005 translated to higher prices paid for MN DNR stumpage. In contrast, with a temporary dip in end-product prices, such as in 2002, willingness to pay for stumpage decreased.

Season of sale. MN DNR timber tracts in the fourth quarter of the calendar year (October to December) had the lowest prices. Stumpage sold in the second quarter (April to June) of the year sold for 17% higher prices than similar tracts sold in the fourth quarter.

Harvest density. An increase in appraised volume per unit tract area (cord equivalents/acre) increases stumpage prices. A one unit increase in harvest density (e.g., going from 20 to 21 cords/acre) increased MN DNR stumpage prices by 1.6%. Low harvest density tracts (e.g., a thinning) sold at a lower price.

Contract length. From 2001 to 2006, an additional year on a timber sale contract increased the price paid for a MN DNR timber tract by 3.9%. While longer timber sale contracts increased the price paid for stumpage from 2001 to 2006, the marginal impact of an extra contract year was constant throughout the entire study period.

Seasonal operating restrictions. Restricting harvest operations to frozen ground conditions, without the possibility for dry ground harvests in other seasons, reduced stumpage price by 7%. Seasonal operating restrictions may be used to protect environmental quality, but such restrictions significantly reduce stumpage prices.

Total appraised volume. The volume of timber contained in the timber tract has a significant positive impact on MN DNR stumpage prices. Tracts with less than 500 cords sold for the lowest per unit (\$/cord) prices. We found little difference in prices for tracts with 1,000 to 1,499 cord and tracts with 1,500 to 1,999 cords. Tracts with at least 2,000 cords of total appraised volume sold for the highest per unit prices, 26.6% higher than tracts with less than 500 cords.

Regular versus intermediate auction tracts. We found no significant differences between intermediate and regular timber tract prices. Further, the marginal price impact of total appraised volume, harvest density, contract length, and seasonal operating restrictions was not different for regular and intermediate auction MN DNR timber tracts.

Paired Bidding Experiment

The second part of this study utilized a field experiment methodology called “paired bidding” to assess the impact minimum bid prices (reserve prices) and contract length have on the price paid for MN DNR stumpage. We conducted paired bidding experiments at three MN DNR sealed bid timber auctions from November 2008 through January 2009. One hundred and forty-eight tracts were advertised for sale at three sealed bid auctions located in the MN DNR’s northwest region, northeast region, and Sandstone area (the latter located in the MN DNR’s Central Region). Ninety-six tracts were assigned the reserve price treatment and 52 tracts assigned the contract length treatment. Each tract was offered for sale as two versions and bidders were required to submit two bids per tract—one for each version.

If a tract was part of the reserve price treatment experiment, one version of the sale was offered with the reserve prices determined by the MN DNR (full reserve price); the other version of the sale was offered with a 50% reduction in the reserve price for all bid species contained in the tract (half reserve price). If a tract was part of the contract length treatment experiment, one version of the sale was offered with a 5-year contract length; the other version was offered with a 2-year contract length. By requiring bidders to submit two bids for the same tract, the experimental design controls for all factors influencing stumpage bids except the treatment variable. After all paired bids were submitted, the sale version (i.e., full reserve price or half reserve price; 2-year contract or 5-year contract) was chosen at random and awarded to the highest bidder for that version.

In addition to submitting paired bids, bidders were required to respond to two survey questions. They were asked to estimate: (1) when they expected to harvest the tract; and (2) how stumpage prices would change between the date of sale and the expected date of harvest. The number of usable paired bids that we received was 293 for the reserve price treatment and 145 for the contract length treatment. Our findings from the paired bidding experiment are as follows.

Reserve Prices

Bidders significantly altered their bidding behavior when faced with lower reserve prices. Bids were, on average, \$3.06/cord equivalent (cordE), or 15.93%, less for half reserve price versions of the tract than for full reserve price versions. If all tracts were sold to the winners of the half reserve price versions, stumpage prices would have been \$1.80/cordE (10.03%) less than if all tracts were sold to the winners of the full reserve price versions. Reserve prices also had a significant impact on bidding behavior and sale price, conditional on the tract receiving at least one set of paired bids.

Reserve prices had little or no impact on bidding behavior for a substantial portion (43%) of the bids. Thirty percent of bids were identical for both versions. Additionally, many MN DNR stumpage bidders (16%) “bid-up” the tract by an identical amount, leading to a 50% reduction in stumpage bids for half reserve price versions. If all tracts were sold to the highest bidder for half

reserve price versions, 61% of the tracts would have sold for lower prices than if all the tracts were sold to highest bidder for the full reserve price version.

For tracts receiving paired bids in our experiment, half reserve prices would have reduced timber sale revenue by 10%. However, under nonpaired bidding conditions, we suspect a portion of unsold tracts offered for sale would have received a bid if they had been offered at the half reserve price. Thus, readers should carefully avoid interpreting average sale price changes as equivalent to gross timber sale revenue changes.

Eighty-seven different firms submitted 293 paired bids for the reserve price treatment tracts—many of them submitting bids for multiple tracts. Using a fixed effects model to control for unobservable firm-specific characteristics and identify how tract-specific characteristics such as volume, density, or location influenced reserve price bid differences, we found that firm-specific characteristics significantly influenced reserve price bid differences. Moreover, these results suggest firm-specific characteristics were the only factors that influenced reserve price bid differences. After controlling for firm-specific characteristics (e.g., bidder experience and skill, stumpage contract inventory levels), tract-specific characteristics (e.g., density, location, volume) had no significant impact on bid differences. While a change in reserve prices significantly altered individual bidding behavior and stumpage prices, underlying factors driving this change were entirely firm-specific.

Contract Length

On average, stumpage bids were \$0.50/cordE (2%) greater for 5-year contract length tracts than for 2-year contract length tracts. This difference was statistically different from zero, yet practically very small. Similarly, the difference in average sale prices (i.e., high bids) was \$0.80 (3%) and statistically significant, but also quite small. The large majority (84%) of bids for 2-year contract length versions were within +/-5% of paired 5-year contract length bids. Approximately 26% of paired bids contained a lower bid for a 2-year contract than a 5-year contract, and 30% percent of tracts would have sold for lower stumpage prices if all tracts were sold as 2-year contract versions.

To further understand this result, we analyzed bidder responses to the additional survey questions asking for their expectations about future stumpage prices and harvest dates. First, we asked bidders to indicate the expected amount of time between when they purchased and planned to harvest the tract. Two-year contract versions reduced average expected harvest dates by approximately six months. For the bidders who would have been awarded the tracts under either of the two different contract scenarios (i.e., high bidders for each contract version), the 2-year contract reduced average expected harvest dates by 0.66 years (8 months). A closer look at expected harvest dates for 5-year contracts revealed that 72% of all bidders expected to harvest tracts within two years. If all tracts were awarded to the highest bidder for 2-year contract versions instead of the highest bidder for 5-year contract versions, purchasers expected to harvest 33% of the tracts at an earlier date.

We also asked bidders to describe their expectations about future stumpage prices. On average, bidders expected a 6.7% reduction in stumpage prices between the date of sale and the date they expected to harvest the tract, or 4.9% per year. Also, no significant difference existed between the expected stumpage prices at the time of harvest for 2-year contracts and the time of harvest

for 5-year contracts. This suggests these bidders were not including a speculative component in their stumpage bids. In general, bidders did not expect a 5-year contract to give them any additional value associated with long-term (three additional years) market stumpage price increases.

Perspectives on Drivers of State DNR Timber Sale Stumpage Prices

Two mail surveys were administered between August and September 2009. One was to buyers of DNR stumpage in the Lake States. The other was to DNR foresters in the three states responsible for establishing and administering timber tracts offered for sale. The two questionnaires were designed in parallel such that perceptions between "loggers" and "foresters" could be directly compared and contrasted. Each questionnaire asked the survey recipients to characterize how different timber tract attributes (e.g., tract contract provisions, tract characteristics, and administrative procedures) changed in importance as economic conditions changed. Logger and DNR forester attitudes and perceptions about timber tract characteristics and factors influencing stumpage bids were evaluated in 2009 with respect to three distinct points in time: (1) the economic climate characterized by depressed stumpage markets at the time the survey was administered (August–September 2009); (2) stumpage markets in 2005 when Lake States stumpage prices were at historic highs; and (3) during a generally "stable" economic environment for stumpage markets as was witnessed in the Lake States from 1995 to 2003.

Of the 1,324 loggers contacted, 551 (42%) responded and 394 (30%) provided completed questionnaires that were determined to be useable. Of the 319 DNR foresters who received the questionnaire, 261 (81%) were returned, of which 231 (70%) were determined useable. Major findings from these surveys are the noted below.

Profile of Loggers

The majority (77%) of DNR stumpage buyers who responded to our survey were loggers, with an average of nearly 27 years of experience in the industry. While sixty percent purchased no more than 20% of their DNR stumpage through a sealed bid auction format, 31% purchased more than 80% of their stumpage through that format. There was a similar split for contracts purchased as lump sum or on a consumer-scale (also referred to as pay-as-you-go or log-scale).

Profile of DNR Foresters

The majority of DNR forestry personnel in MN, MI, and WI who responded to our survey were field foresters (66%), with 24% employed as forestry technicians. Tenure with the DNR among the survey respondents was considerable, averaging over 16 years. Most foresters sold either minimal or nearly all of their tracts using a sealed bid format.

Perceived Frequency of DNR Timber Tract Characteristics

Logger Perspectives. Loggers characterized the frequency by which DNR tract characteristics contained 13 different characteristics across the three economic periods. Five of the seven (contracts exceed 4 years, summer logging access, high volume of quality wood, close to markets for my timber, contain only marketable species) exhibit downward trends over time; that is their frequency was perceived to be less common today than in the past. These five tract characteristics all have the potential to increase tract profitability, yet were seen by loggers as being not commonly associated with DNR tracts offered for sale in the current economically-challenging market conditions. Two tract characteristics (has restrictive timber tract regulations,

substantial bid guarantee or down payment) were perceived to significantly increase in frequency over time. These two factors, which could decrease logging profitability, were perceived by loggers to be more commonly associated with DNR tracts offered for sale in today's difficult economic climate as compared to the other economic periods evaluated.

DNR Forester Perspectives. Like loggers, DNR foresters believed tracts offered for sale with contracts exceeding four years, containing high quality wood, and containing only marketable species decreased in frequency over time. Foresters also felt that the frequency of DNR tracts offered for sale with low bidding competition is significantly higher in today's depressed timber markets than during stable and robust stumpage market conditions—a condition that could improve the profitability of a tract by reducing the cost of stumpage.

Contrasting Logger and DNR Forester Perspectives. DNR tracts containing restrictive regulations, requiring considerable road development, and sold using a sealed bid auction format were considered significantly more common by loggers than DNR foresters over all three economic periods evaluated. Loggers also believed there was a greater use of substantial bid guarantees or down payments for purchased DNR tracts than did foresters, but this difference was only significant during today's weak economic climate. DNR foresters, in contrast, felt that more of their tracts offered for sale were close to the logger's wood product markets and close to existing tracts than did loggers. DNR forester perspectives regarding the frequency of their tracts having low bidding competition was also significantly higher than the perspectives of loggers, but only during today's economic environment. Foresters also believed that prior to today's market conditions, tract contracts exceeding four years was a more common occurrence than did loggers during the same two economic periods. Given the variability in timber sale policies and practices across the three states, some of these differences may be the result of a different proportion of loggers and forester responses from each state.

Perceived Importance DNR Foresters Place on Tract Characteristics

Logger Perspectives. Loggers felt DNR foresters placed less emphasis today on tracts with summer logging access and containing a high volume of quality wood as compared to the past. Timber tracts containing restrictive regulations were perceived by loggers to significantly increase in importance among DNR foresters over time.

DNR Forester Perspectives. Like loggers, DNR foresters believed tracts with restrictive regulations have increased in importance over time. Foresters also thought the importance they place on tracts that are close to product markets and those that contain only marketable species increased over time.

Contrasting Logger and DNR Forester Perspectives. DNR tracts having timber sale contracts of four or more years and those sold using sealed bid auction format were viewed by loggers to be significantly more important to DNR foresters than the actual importance DNR foresters placed on these tract attributes. Loggers also felt DNR foresters placed greater importance on tracts with restrictions than the importance DNR foresters actually attributed to this tract characteristic during the two most recent economic periods evaluated (i.e., 2005 and today). DNR foresters, in contrast, place significantly greater actual importance on tracts that have high total timber volume, summer logging access, high volume of quality wood, only marketable species, and are close to other tracts owned by the logger. State-specific timber sale policies and the different

proportion of loggers and forester responses from each state may account for some of these differences.

Perceived Importance Loggers Place on Tract Characteristics

Loggers were asked to indicate the importance they place on 17 physical, contractual, and tract characteristics. Similarly, DNR foresters were asked to state how important each characteristic is to loggers when they bid on a DNR tract offered for sale.

Logger Perspectives. Only five tract characteristics were viewed by loggers not to change in importance over time. They include having high total timber volume, needing to cross private land to access the timber, having low bidding competition, sold using a sealed bid auction format, and knowing the identify of the individual forester who will supervise the sale. Those that increased in importance over time were contracts four years or more in length, summer logging access, high volume of quality wood, close to markets, contains only marketable species, close to other tracts, restrictive tract regulations, considerable road development needed, and requires a substantial bid guarantee/down payment. The logger's existing timber sale inventory, expectation of future stumpage prices, and knowing who the forester was who appraised the tract also increased in importance over time.

DNR Forester Perspectives. DNR foresters felt 13 of the 17 tract characteristics increased significantly over time. Of these, 11 were the same ones loggers placed increasing importance on over time. The two tract characteristics foresters (but not loggers) felt increased in importance over time when it came to bidding on DNR stumpage were low bidding competition and high total timber volume.

Contrasting Logger and DNR Forester Perspectives. For eight of the 17 characteristics evaluated, the actual influence has on a logger's bid for stumpage exceeds what DNR foresters thought its influence would be. These characteristics include tracts with: contracts of length four years or more, high volume of quality wood, restrictive tract regulations, need to access across private property, low bidding competition, stumpage sold using a sealed bid auction and the influence of the foresters who prepared and will supervise the tract. In contrast, DNR foresters overestimated the actual importance reported by the loggers with regard to the following four characteristics: high total timber volume, only marketable species, close to other tracts, and existing tract inventory. The other three characteristics (contain high total timber volume, contain only marketable species, and the logger's existing inventory of tracts) were significantly less important to loggers in determining their stumpage bids than what DNR foresters perceived their importance to be only in today's depressed economic climate. The different proportion of loggers and forester responses from each state (and state-specific timber sale policies) likely accounts for some of these differences.

Most Important Timber Tract Characteristics

Loggers felt summer logging access was the most important characteristic of a tract auctioned for sale by the DNR. Other important characteristics include stands with high quality wood, stands that only contain marketable tree species, and stands with high total timber volume. DNR foresters' perceptions of the most important characteristics aligned closely with the importance

actually assigned by loggers—both groups identified the same four most important characteristics.

The Ideal Timber Tract

The views of DNR foresters and loggers about what constitutes the ideal tract of timber offered for sale by the DNR were relatively consistent. This tract is approximately 90 acres, contains roughly 4,000 cords of wood, has between 4 to 6 product markets, and is sold on a 3.5 year contract. Nearly 60% of loggers preferred sealed bid auctions while 52% of foresters thought loggers prefer oral auctions. Seventy-two percent of the foresters felt that loggers preferred lump sum tracts, while only 47% of loggers preferred this method of payment.

Perspectives on Sealed Bid Timber Auctions

Loggers are uncertain whether oral auctions result in higher prices paid for stumpage. Most felt that purchasing stumpage sold using a sealed bid format makes it harder for them to achieve their ideal inventory of tracts as compared to stumpage sold on an oral auction. Yet they believed sealed bid auctions create less bidding frenzy than oral auctions, and sealed bid auctions result in higher prices paid than would have been the case with an oral auction. Only 22% of the responding loggers said that sealed bid auctions decrease competition for stumpage when compared to oral auction sales.

The majority of foresters felt that sealed bid auctions make it more difficult for loggers to manage their inventory of tracts, generate less bidding frenzy, require loggers to spend more time preparing a bid for the stumpage, and result in loggers paying more for stumpage than if it had been sold through an oral auction. Only 23% of the foresters felt sealed bid auctions decreased bidding competition. Nearly two-thirds of foresters believe sealed bid auctions require more preparation time from loggers than oral auction stumpage sales. Yet, slightly less than a majority of loggers (49%) felt this was the case.

Method of Paying for Purchased Stumpage

Over three-fourths of the loggers felt lump sum methods require more bid preparation time than stumpage sold on a consumer scale basis, and most felt lump sum sale methods pose greater financial risk to them as compared to stumpage sold on consumer scale. Only 32% of the loggers agreed with the statement that lump sum methods are less competitive than consumer scale methods.

Nearly two-thirds of responding DNR foresters felt lump sum methods require more effort to prepare a tract for auction. A majority also felt that lump sum methods create more financial risk to their agency than do consumer scale methods. Foresters were uncertain whether lump sum methods are less expensive to administer than consumer scale methods. Only one in five stated that lump sum methods are less competitive than consumer scales, and only 16% agreed with the statement that lump sum methods are less likely to result in achieving stand management objectives.

Conclusions

A review of state timber sale programs across the U.S. revealed that the physical, legal, and economic characteristics surrounding state timber sale programs differ in many respects, and a “one size fits all” guide to state timber sale design does not exist. However, study results

identified several areas that may help promote more effective and efficient state timber sale programs: (1) clear identification and prioritization of timber sale program goals; (2) adequate flexibility to adjust methods of sale; and (3) protected forest management accounts. In addition, increased communication between state timber sale programs may improve program decision-making.

The national review of state timber sale programs across the US, combined with an analysis of factors influencing Minnesota stumpage prices, revealed several opportunities to potentially improve MN DNR timber sale policies and procedures. They include: (1) more sealed bid auctions; (2) fewer 3 to 5 year contracts; and (3) a re-evaluation of the intermediate timber sale program. Most states utilize sealed bid auctions and supervisors in these states strongly prefer sealed bids over oral auctions. The MN DNR may be able to increase timber sale revenue and reduce the likelihood of exorbitant bidding by moving towards more sealed bid auctions. In addition, most states utilize 2-year timber sale contracts. Contracts longer than two years may increase stumpage prices in Minnesota, but the premiums are driven almost entirely by price speculation. Two-year contracts may effectively reduce price speculation and encourage quicker timber harvests without substantially limiting the flexibility stumpage purchasers' need to manage their inventory of stumpage contracts. Finally, study results revealed no significant difference between the price paid for timber at intermediate and regular auctions. More research evaluating the different levels of competition within intermediate and regular auctions would help further evaluate the impact of intermediate sale program on the small business community and overall health of the local wood products industry.

Several other administrative policies and procedures used to sell MN DNR timber were shown to have a significant impact on the price paid for state stumpage, including allowing a chance for dry ground timber harvests, offering more medium and large volume sales, and offering sales in April-June. Timber sale administrators must weigh the potential financial advantages associated with these characteristics against other forest management considerations (e.g., vegetative management, wildlife habitat) and a desire to maintain a healthy wood products industry.

Lake States loggers and foresters agree that summer logging access, substantial volumes of high quality wood, the presence of marketable species, high total timber volume per tract, and expectations about future stumpage prices are the most important factors firms consider when determining how much to bid for stumpage. Stumpage purchasers disagree about their preferred auction method (sealed bid vs. oral bid) and payment method (lump sum vs. consumer scale). They also believe some characteristics of state timber tracts are changing in ways that potentially make it more difficult for the local wood products industry to operate profitably.

Several opportunities for future research and pilot projects directed at state timber sale program design and administration were identified. They include: (1) evaluating how competition changes between intermediate and regular timber sale auctions; (2) identifying the impact reserve prices have on the probability a tract receives at least one bid; (3) evaluating stumpage price differences between first-price sealed bid auctions and ascending oral bid auctions; (4) assessing whether second-price sealed bid timber auctions (i.e., Vickrey auctions) would effectively elicit bids that reflect true willingness to pay; (5) pilot test a log sort program to further assess advantages and disadvantages; (6) identify ways to reward reliable, high quality loggers with more stumpage

contracts; and (7) test various incentives to encourage loggers to harvest the timber within a time frame that will achieve the silvicultural objectives for the stand.

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1. Introduction

1.1. Background

Recent fluctuations in Minnesota's stumpage market have raised concern about the policies, procedures, and contract provisions associated with the sale of timber from state-administered forest land managed by the Minnesota Department of Natural Resources (MN DNR). In its December 2006 report, Governor Pawlenty's Task Force on the Competitiveness of Minnesota's Primary Forest Products Industry identified timber sale policies and procedures as one of the most urgent issues that need to be addressed (Governor's Task Force on the Competitiveness of Minnesota's Primary Forest Products Industry 2006). The report recommended a study be undertaken to assess how state timber sale procedures, sale contractual provisions, and timber tract characteristics impact stumpage prices, and identify and recommend best practices for setting up and administering timber sales on state-owned forest lands administered by the MN DNR.

For such an assessment to be undertaken, a thorough understanding of public timber sale program characteristics is needed, especially those administered by state governments. State governments collectively own 69 million acres of forest land in the US, with individual states owning from 20,000 acres (Kansas) to more than 27 million acres (Alaska) of forest land. In the Lake States, states are the largest public forest land managers, with the state of Minnesota owning approximately 4.4 million acres of forest land—nearly 27% of the state's forest land base (Smith et al. 2009). Much of the current state-owned forest land in the US was originally granted in the 19th century by Congress to newly joined states for the purpose of supporting schools and other public institutions. This encouraged states to place a relatively heavy emphasis on meeting fiduciary responsibilities (Souder and Fairfax 1992). To this day, the explicit requirements to meet fiduciary responsibilities and produce other environmental and social benefits present many difficult challenges for state forest land managers.

An important aspect of state forest land management is the sale of timber on state-owned forest land. For the purposes of this study, we defined state timber sale programs as the collection of laws, rules, and operational policies, combined with the personnel and technology used to implement these laws, rules, policies, that impact a state's ability to sell timber from the land it owns. In general, state timber sale programs are responsible for setting-up tracts¹ of timber to be offered for sale, selling the rights to harvest the standing timber (i.e., stumpage) to willing purchasers, supervising the harvest operation, and collecting payment for the timber harvested. These programs play an important role in achieving the fiduciary and management responsibilities associated with state-owned forests (e.g., source of revenue to state governments; means of achieving vegetative management and wildlife habitat goals) and as an important supplier of wood fiber for the nation's primary forest products manufacturing industry.

Minnesota's state-administered forest land is managed by the MN DNR's Division of Forestry, whose timber sale program plays an important role as both a supplier of wood to the state's wood products industry and as a source of revenue for the its local K-12 education system. State timber

¹ A tract of timber is a well-defined area of forest land where the standing timber (stumpage) is scheduled to be offered for sale. A tract may contain two or more contiguous blocks of land, or "cutting blocks."

is typically sold to the highest bidder at public auctions held at various times of the year and locations throughout Minnesota. The sale process begins when the MN DNR selects a tract to be harvested and a forester “cruises” the tract to estimate the amount of volume available in each species and product category. This species-product information, along with a minimum bid price (reserve price) for each species-product category, is advertised to all potential bidders before the auction. The bidder who submits the highest bid at least equal to the reserve price is awarded the sale. Purchasers of MN DNR timber are required to make a down payment and sign a contract specifying purchaser obligations, such as harvest regulations, payment procedures, and requirements to harvest the wood within a specified length of time (contract length), typically two to five years. Approximately 735,000 cords² of wood were harvested on MN DNR lands in 2005—21% percent of the total volume of wood harvested in Minnesota (MN DNR 2006a). Timber sales in 2005 also accounted for \$9.48 million in gross revenue to the Permanent School Fund which helps pay for K-12 education (MN DNR 2006b).

In 2005, MN DNR stumpage prices reached unprecedented levels. For example, the average aspen pulpwood price from all public sales in Minnesota rose from approximately \$29/cord in 2003 to nearly \$60/cord in 2005, a 44% average annual increase (MN DNR 2010). In many cases, stumpage purchasers bid more than five times the appraised market value of the wood. From 2006 through 2008, conditions changed dramatically and the average price of aspen pulpwood sold on public land dropped to less than \$27/cord and many tracts offered for sale did not receive a bid. A significant decline in the housing market greatly reduced demand for wood products used to construct buildings, such as oriented strand board (OSB). A substantial drop in wood product markets tied to the construction and building sectors, in addition to the extremely high timber contract bids from the year before, led to significant market struggles for much of Minnesota’s wood products industry. Many stumpage buyers were saddled with high-priced 2005 stumpage contracts, but no markets for their wood. In some cases, these stumpage purchasers were unable to pay the high prices from 2005 and were forced to forfeit their timber sale contracts.³ The market struggles also led to the shutdown of three of the state’s largest OSB manufacturing mills (MN DNR 2008).

The impacts from these market fluctuations were not limited to the private sector. The large number of tracts offered for sale on state lands that went unsold significantly hindered the state’s ability to generate adequate financial return to schools and local units of government. Also, since many of the 2005 timber sale contracts were forfeited, the state did not receive the expected revenue from these sales and silvicultural prescriptions were delayed, making it difficult to meet MN DNR forest management objectives (e.g., revenue to school trust fund, vegetative management, wildlife habitat enhancement).

1.2. Study Objectives

Stakeholder groups, including the MN DNR, the Minnesota forest products industry, loggers, and local school districts, could potentially benefit from improved public timber sale processes that result in greater stability to the local schools and industry, enhanced environmental

² A cord is a unit of volume measurement. One cord is 128 cubic feet of wood of varying dimensions (e.g., 4’ X 4’ X 8’).

³ Personal correspondence with MN DNR state timber sale program coordinator.

protection, and increased financial returns to the state. However, such policy changes need to be informed by a greater understanding of state timber sale characteristics, policies, and procedures.

States with substantial state-administered forest land bases have developed policies and procedures for the management and sale of timber from these lands that reflect the physical (e.g., extent and distribution of forests), ecological (e.g., types of forest cover), economic (e.g., forest-based industry and market structure), and social (e.g., logger characteristics) conditions unique to each state. The uniqueness of these conditions has led to considerable state-to-state variability with respect to methods for setting base stumpage prices and selling timber, restrictions on market participation for tracts offered for sale, and the terms and conditions of timber sale contracts. Furthermore, many of these factors are thought to have a substantial, yet often unknown, impact on prices received for tracts offered for sale from state forest lands.

The purpose of this study was to identify opportunities to improve the design and administration of timber sales on state-owned forest lands administered by the MN DNR. We wanted to describe the characteristics of and procedures used by state timber sale programs across the country, as well as assess the degree to which various factors, including wood product market conditions, timber tract characteristics, state timber sale procedures, and sale contractual provisions, impact state stumpage prices.

We used five different methods of data collection and analysis to accomplish our study goals. First, we used a mail-back questionnaire to describe the characteristics of and procedures used by state timber sale programs across the country and identify opportunities to improve the design and administration of state timber sale programs (Section 2). Second, we conducted follow-up focus groups with state timber sale program supervisors to identify and describe common barriers to effective administration and practical opportunities to improve the design and implementation of state timber sale programs (Section 3). Third, we conducted a statistical analysis of historic timber sale records to identify and assess factors that influenced 2001-2006 MN DNR stumpage prices (Section 4). Fourth, we designed and implemented paired bidding experiments at MN DNR timber auctions to assess how changes in contract length and reserve price influence stumpage bidding behavior (Section 5). Finally, we conducted a survey of state agency foresters and stumpage purchasers in the Lake States to identify the relative importance of factors influencing bidding behavior for state stumpage (Section 6).

2. National Review of State Timber Sale Programs

2.1. Background

Public timber sale policies and procedures vary considerably across landscapes and both across and within levels of government. Land ownership history and statutory guidance heavily influence the design of each agency's timber sale program. For example, the management of federal forest lands under the authority of the USDA-Forest Service (USDA-FS) is guided principally by the Multiple-Use, Sustained Yield Act of 1960 (16 U.S.C. 528-531) which focuses on "net public benefits," with no explicit requirement to maximize financial returns from its timber sale program. In contrast, much of the nation's state-owned forest land was acquired through federal land grants with the purpose of funding the state's education system (Souder and Fairfax 1992). Consequently, many state forest management agencies believe they are subject to

a trust mandate and, in turn, develop timber sale policies and procedures with a heavy focus on meeting their fiduciary responsibilities (Souder and Fairfax 1992).

Each state has a unique history of environmental, economic, and political conditions that helped shape its timber sale program. Unfortunately, there is not much published literature describing the various policies and procedures used by state timber sale programs.⁴ Souder and Fairfax (1992) provide the most comprehensive review of state forest land management in their book *State Trust Lands: History, Management, and Sustainable Use*. However, they restrict their analysis to states in the western US and do not describe the specific policies and procedures used to sell timber on state-owned forest land. Our review of the literature revealed only two examples of comprehensive and systematic comparisons of the timber sale policies and programs used by state agencies. One is a report published by the Minnesota Office of the Legislative Auditor (MN OLA 1982) which described characteristics of state timber sale programs in Minnesota, Wisconsin, Michigan, California, Washington, and Maine. The report documented significant differences in auction methods, scaling requirements, reserve prices, payment schedules, contract lengths, and harvest requirements that existed between these states. The other report, prepared by Leefers and Potter-Witter (2006), compared stumpage appraisal methods used by state agencies in the Lake States. Both studies describe methods used to set up and administer state timber sales within a limited number of states. To date, no published studies have provided a comprehensive national assessment of the wide range of state timber sale program characteristics, policies, and procedures.

The purpose of this portion of the study was to describe the characteristics of and procedures used by state timber sale programs across the country and identify opportunities to improve the design and administration of state timber sale programs. To improve the efficacy of state timber sale programs, more information is needed about the variety of methods used to sell timber from state-owned forest land throughout the US. Such information should also be accompanied by adequate knowledge of the underlying factors influencing the methods used to sell timber on state-owned land, including the physical characteristics of state-owned timberland, sources of program direction and goals, and characteristics of the surrounding region's wood products industry.

2.2. Data and Methods

We utilized survey methodology to gather information about state timber sale programs across the country. A series of telephone calls to state forestry agencies in all fifty states were used as an initial screen to identify the existence of state timber sale programs as well as their location within state government. Through these phone calls, we identified 46 agencies in 43 different states that administered timber sales on state-owned forest land in 1999-2008.^{5,6}

⁴ See Leal (1995), US GAO (1996), and Koontz (1997) for comparisons between federal and state timber sale programs.

⁵ The 10-year timeframe was chosen because it provided the clearest distinction between the states that regularly conduct timber sales, and those that do not. Arizona was eliminated from our survey population because they had not administered a timber sale in the last 10 years due to depressed local wood product markets. Nebraska, New Mexico, North Dakota, Oklahoma, Illinois, Arizona, and Kansas were eliminated because they do not sell timber on state-owned forest land.

⁶ Questionnaires were sent to two state agencies in Alabama (Forestry Commission and State Lands Division) and three state agencies in Massachusetts (Bureau of Forestry, Division of Water Supply Protection, and Division of

Our survey population was individuals with lead responsibility for supervising programs that sell timber on state-owned forest land (i.e., state timber sale program supervisors). We felt that program supervisors were best suited to answer a variety of questions related to their state's timber sale program operations. These individuals deal with timber sale program administration matters on a daily basis and have expert knowledge of the policies, procedures, and contract provisions used to set-up and administer state timber sales. Furthermore, we felt that if these individuals were unable to answer questions about their state's timber sale program, they would be able to identify other timber sale personnel who could provide the requested information.

Each state timber sale program has developed policies and procedures used to sell timber that reflect a web of environmental, political, and economic characteristics unique to their state (Figure 1). To better understand the conditions under which these policies and procedures were developed, we designed a mail-back questionnaire that also gathered information about the physical characteristics of each state's forest land base, sources of program direction and program goals, and the characteristics of the surrounding wood products industry. While we did not expect to be able to describe the complete history of state timber sale program development, a greater understanding of these characteristics provides a useful context in which to view a state agency's timber sale program design and administration.

The questionnaire contained a variety of multiple-choice, fill-in the blank, and open-ended questions (see Appendix A). Multiple choice and fill-in the blank questions were used to obtain descriptive information about the physical characteristics of state-owned forest land, factors influencing program direction and goals, characteristics of the surrounding wood products industry, and methods for selling timber in each state. The open-ended questions asked timber sale program supervisors to identify recent changes made to their program and gave them an opportunity to describe any perceived opportunities for program improvements. Due to the small population size, we were unable to conduct presurvey focus groups to test a draft of the questionnaire. Instead, we pretested the questionnaire with three timber sale program administrators (2 in WI, 1 in MN) who have intimate knowledge of state timber sale program operations. Pretesters were sent a copy of the draft questionnaire and asked to comment on the clarity and appropriateness of questions. Their comments and suggestions were incorporated into the final questionnaire.

In April 2009, the questionnaire was mailed, or e-mailed, to all 46 state timber sale program supervisors⁷. We followed many of the general guidelines described by Dillman (2000), including a prenotice postcard, a questionnaire and cover letter, a reminder letter, a second questionnaire and cover letter, and a follow-up phone call to nonrespondents. Since our survey population was small, we made a few minor modifications to the typical process used to implement large population surveys. First, no sampling was utilized. The questionnaire was mailed to all 46 timber sale program supervisors identified through our telephone contact with

Fisheries and Wildlife) because both states have multiple agencies that oversee a substantial portion of state-administered timber sales.

⁷ During our initial phone contacts, two supervisors requested that we e-mail them an electronic version of the questionnaire. We only e-mailed questionnaires upon request; otherwise, questionnaires were sent through the US postal service.

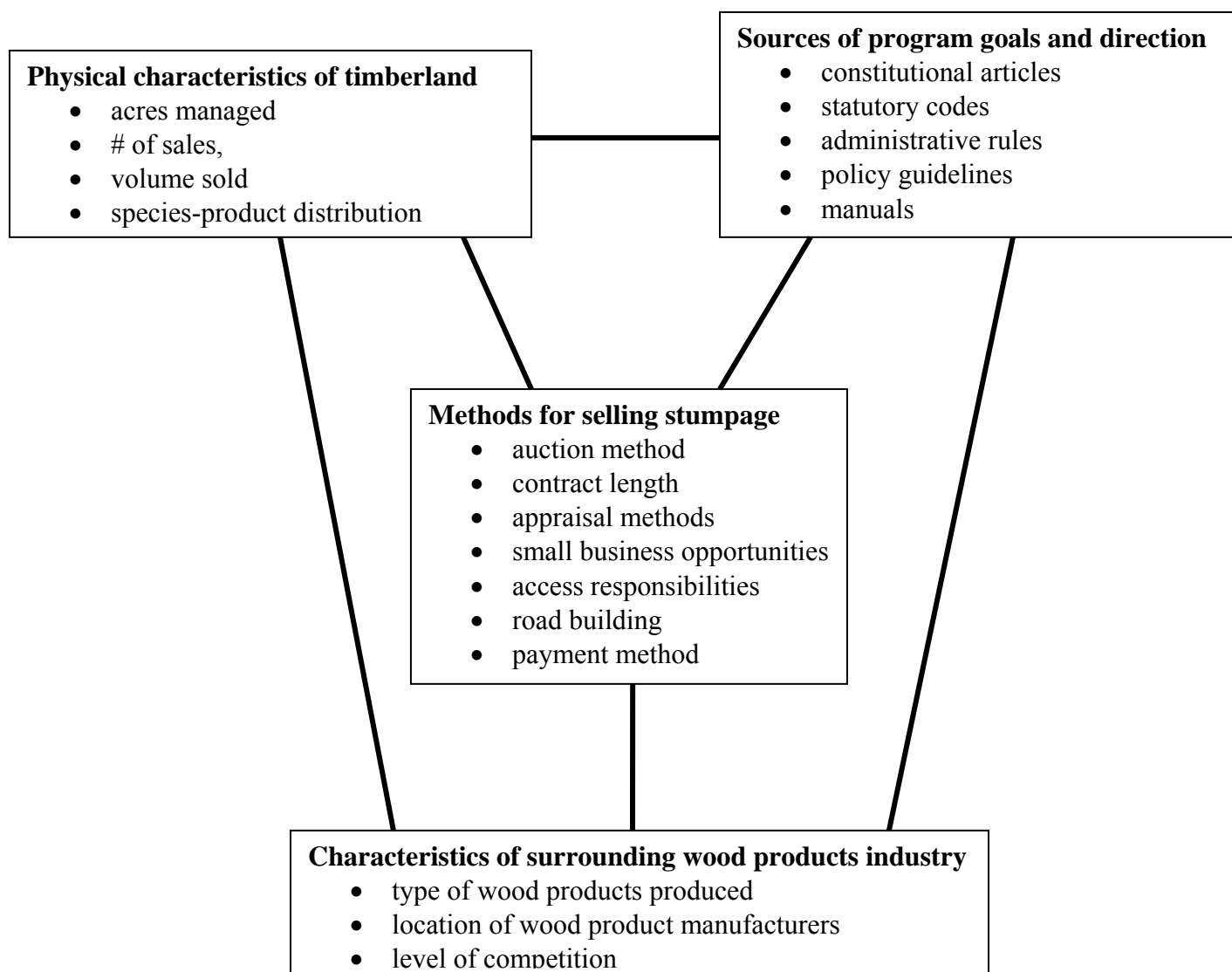


Figure 1. Factors potentially influencing state timber sale program design and administration.

state forestry agencies. Second, we attempted to enhance the quantity and quality of questionnaire responses by personalizing many of our contacts with supervisors. For example, through our initial phone calls to identify state timber sale program supervisors, we made preliminary contact with all 46 supervisors. These initial telephone conversations gave us an opportunity to obtain contact information, briefly describe the purpose of our study, and ask supervisors if they were willing to complete a questionnaire about their state's timber sale program. Additionally, instead of typing cover letters and reminder postcards, they were handwritten and signed. The handwritten letters were used to enhance the personal appeal to our survey population, an important component of generating high response rates (Smith and Bers 1987, Dillman 2000). Finally, after two rounds of questionnaire mailings, we made a series of follow-up telephone phone calls to nonrespondents.

2.3. Results

Thirty-seven timber sale program supervisors returned completed questionnaires (80% response rate). Two of these supervisors responded, but indicate that they would not have enough time to complete the questionnaire. After further discussion, they agreed to complete a shortened version of the questionnaire that contained a subset of key questions⁸. Supervisors from the Alabama State Lands Division, California Department of Forestry and Fire Protection, Georgia Forestry Commission, Louisiana Department of Wildlife and Fisheries, Maryland Department of Natural Resources Forest Service, Massachusetts Bureau of Forestry, Mississippi Forestry Commission, Nevada Division of Forestry, and New York Department of Environmental Conservation did not respond to the questionnaire. Nonrespondents were from a variety of geographic regions and were located in states with diverse forest land bases (i.e., acreage of state-owned forest land, species-product composition). Thus, we assumed nonresponses did not significantly bias our survey results.

The following subsections describe responses from state timber sale program supervisors regarding the: (1) physical characteristics of their state-owned forest land; (2) legal and administrative sources of direction and program goals; (3) characteristics of the surrounding wood products industry; and (4) methods used to set-up and administer state timber sales. Responses to open-ended questions were analyzed to identify recent changes made in state timber sale programs, opportunities for program improvements, and unique policies or procedures used to sell state timber. In many instances, our analysis attempted to describe an “average state timber sale program.” We made the unit of analysis an individual state timber sale program in order to weight responses from each state timber sale program supervisor equally. Therefore, results presented in the following subsections reflect an underlying assumption that the size and level of activity (e.g., total area of timber land, number of sales, volume sold) of an individual state program do not affect the quality of information present in questionnaire responses.

2.3.1. Physical Characteristics⁹

Supervisors were asked a series of questions designed to gather information about the physical characteristics of their state agency’s timber sale program, such as the total area of timberland administered, the annual number of timber sales, the annual timber volume sold, and the typical species-product composition of timber sales. Summaries of responses from northern states (Table 1), southern states (Table 2) and western states (Table 3) are provided below¹⁰.

⁸ The shortened version of the questionnaire contained question numbers 1, 3, 6, 8 (revised), 9 (revised), 10, 12, 18, 19, 34, 39, 42, 45, 46, and 50 from the full version (Appendix A)

⁹ This section discusses responses to question numbers 1, 3, 9, 10, and 12 on the questionnaire (Appendix A).

¹⁰ States were placed in the same northern, southern, and western regions used to delineate regional applied forestry journals (*Northern Journal of Applied Forestry*, *Southern Journal of Applied Forestry*, and *Western Journal of Applied Forestry*).

Table 1. Physical characteristics of state-administered timberland in northern states.

State Agency	Area of timberland administered^u	2008 timber sale activity	2008 volume sold[†]	Species- products*
Connecticut Department of Environmental Protection	170,000 acres	15 sales 1,200 acres	3,000 MBF	10% softsaw; 90% hardsaw
Delaware Forest Service	16,000 acres	3 sales 93 acres	732 MBF; 6,384 green tons.	15% softpulp; 74% softsaw; 10% hardsaw; 1% other
Indiana Department of Natural Resources Division of Forestry	153,000 acres	50 sales 5,256 acres	11,300 MBF	94% hardsaw; 6% other
Iowa Department of Natural Resources	45,000 acres	4 sales 90 acres	297 MBF	100% hardsaw
Maine Department of Conservation- Bureau of Parks and Lands	400,000 acres	4 sales 4,000 acres	101,000 cords	12% soft pulp; 44% hardpulp; 32% softsaw; 5% hardsaw; 6% energy
Massachusetts Department of Conservation and Recreation Division of Water Supply Protection	100,000 acres	40 sales 1,160 acres	6,050 cords; 3,900 MBF; 9,900 green tons	10% softpulp; 5% hardpulp; 40% softsaw; 15% hardsaw; 30% energy
Massachusetts Department of Conservation and Recreation- Division of Fisheries and Wildlife	140,000 acres	6 sales 266 acres	121 cords; 1,329 MBF.	10% softpulp; 40% softsaw; 20% hardsaw. 25% energy; 5% other
Michigan Department of Natural Resources	3,900,000 acres	700 sales 50,000 acres	720,000 cords; 90,000 MBF.	40 % softpulp; 40% hardpulp; 10% softsaw; 10% hardsaw
Minnesota Department of Natural Resources- Division of Forestry	3,000,000 acres	1182 sales 57,068 acres	1,104,023 cords; 8,759 MBF; 46,450 green tons	32% softpulp; 60% hardpulp; 8% other
Missouri Department of Conservation	600,000 acres	64 sales 7557 acres	1520 MBF	85% hardsaw; 15% other
New Hampshire Division of Forests and Lands	210,000 acres	25 sales 1848 acres	16,570 cords; 6,134 MBF.	10% softpulp; 30% hardpulp; 50% softsaw; 10% hardsaw
New Jersey Forest Service	400,000 acres	6 sales 70 acres	300 cords; 191 MBF.	40% hardsaw; 60% hard firewood
Ohio DNR- Division of Forestry	190,000 acres;	26 sales	8,010 MBF; 22,266 green tons	10% softpulp; 10% hardpulp; 80% hardsaw
Pennsylvania Dept. of Conservation and Natural Resources- Bureau of Forestry	2,100,000 acres	141 sales 12,820 acres	9,901 cords; 48,588 MBF; 3,118,000 cubic ft	30% hardpulp; 65% hardsaw; 5% other
Rhode Island Dept. of Environ. Management Division of Forest Environment	44,000 acres	2 sales 36 acres	400 cords; 42 MBF; 320 green tons.	25% softsaw; 25% hardsaw; 50% energy

State Agency	Area of timberland administered^u	2008 timber sale activity	2008 volume sold[†]	Species- products*
South Dakota- Custer State Park	35,997 acres	Not available	4,525 cubic ft.	100% softsaw
Vermont Department of Forests, Parks, and Recreation	360,000 acres	20 sales 2,100 acres	2,133 cords; 1,563 MBF	5% softpulp; 15% hardpulp; 20% softsaw; 60% hardsaw
West Virginia Division of Forestry	63,000 acres	5 sales 330 acres	2,778 MBF; 4057.4 tons (pulp)	12% softsaw; 88% hardsaw
Wisconsin Department of Natural Resources	930,000 acres	211 sales 14,833 acres	240,000 cords; 6,324 MBF	27% softpulp; 65% hardpulp; 8% other

^uState administered timberland was defined as land where: (1) the state owns fee title; (2) state agencies are responsible for managing the land; (3) excess of 20 cubic feet of wood per year is capable of being grown; and (4) timber harvests are legal.

[†]MBF= thousand board feet

*Percent of annual stumpage volume sold in each species-product category (“softpulp” = softwood pulpwood, “softsaw” = softwood sawtimber, “hardpulp” = hardwood pulpwood, “hardsaw” = hardwood sawtimber)

Table 2. Physical characteristics of state-administered timberland in southern states.

State Agency	Area of timberland administered ^a	2008 timber sale activity	2008 volume sold [†]	Species-products*
Alabama Forestry Commission	24,874 acres	7 sales	24,000 green tons	20% softpulp; 30% hardpulp; 40% softsaw; 10% hardsaw
Arkansas Forestry Commission	21,000 acres	6 sales 1,435 acres	3,276 MBF	90% softsaw; 10% hardsaw
Florida Division of Forestry	1,043,685 acres	8 sales 28,265 acres	1,376,345 green tons	71% softpulp; 26% softsaw; 3% other
Kentucky Division of Forestry	40,000 acres	3 sales 332 acres	1,246 MBF; 22,000 green tons	70% softpulp; 20% softsaw; 10% hardsaw
North Carolina Division of Forest Resources	43,000 acres	5 sales 883 acres	19,610 cords; 3083 MBF.	69% softpulp; 31% softsaw
South Carolina Forestry Commission	430,000 acres	Not available	1,102 cords; 1,700 MBF.	Not available
Tennessee Dept. of Agriculture-Division of Forestry	166,000 acres	16 sales 764 acres	8,403 MBF	18% softsaw; 80% hardsaw; 2% other
Texas Forest Service	9,000 acres	2 sales 168 acres	250 cords; 450 MBF	15% softpulp; 80% softsaw; 5% other
Virginia Department of Forestry	59,000 acres	8 sales 1,198 acres	25,880 cords; 2,197 MBF	30% softpulp; 17% hardpulp; 27% softsaw; 26% hardsaw

^aState administered timberland was defined as land where: 1) the state owns fee title; 2) state agencies are responsible for managing the land; 3) excess of 20 cubic feet of wood per year is capable of being grown; and 4) timber harvests are legal.

[†]MBF= thousand board feet

*Percent of annual stumpage volume sold in each species-product category (“softpulp” = softwood pulpwood, “softsaw” = softwood sawtimber, “hardpulp” = hardwood pulpwood, “hardsaw” = hardwood sawtimber)

Table 3. Physical characteristics of state-administered timberland in western states.

State Agency	Area of timberland administered ^u	2008 timber sale activity	2008 volume sold [†]	Species-products*
Alaska Division of Forestry	24,000,000 acres	81 sales 1,838 acres	15,687 MBF	80% softsaw; 19% energy; 1% other
Colorado State Forest Service	400,000 acres	Not available	Not available	90% hardsaw; 10% other
Idaho Department of Lands	1,035,253 acres	24,824 acres	222,000 MBF	94% softsaw; 6% other
Hawaii Dept. of Land and Natural Resources- Division of Forestry and Wildlife	425,000 acres	Not available	70 MBF	100% hardsaw
Montana Dept. of Natural Resources and Conservation	700,000 acres	76 sales 5,000 acres	Not available	95% softsaw; 5% other
Oregon Department of Forestry	780,000 acres	69 sales 12,098 acres	214,000 MBF	85% softsaw; 11% hardsaw; 4% other
Utah School and Institutional Trust Lands Administration	123,544 acres	1 sale 95 acres	9,000 green tons	50% softsaw; 50% excelsior
Washington Department of Natural Resources	2,100,000 acres	191 sales 28,971 acres	660,360 MBF	85% softsaw; 10% hardsaw; 5% other
Wyoming Office of State Lands and Investments- Forestry Division	137,000 acres	23 sales 1,435 acres	1,526 cords; 2,834 MBF; 2,061 green tons	10% softpulp; 90% softsaw

^uState administered timberland was defined as land where: 1) the state owns fee title; 2) state agencies are responsible for managing the land; 3) excess of 20 cubic feet of wood per year is capable of being grown; and 4) timber harvests are legal.

[†]MBF= thousand board feet

*Percent of annual stumpage volume sold in each species-product category (“softpulp” = softwood pulpwood, “softsaw” = softwood sawtimber, “hardpulp” = hardwood pulpwood, “hardsaw” = hardwood sawtimber)

Prior to the survey, we hypothesized that there would be large variation in the physical characteristics of state timber sale programs. Our survey data confirm this hypothesis: there is a striking degree of variation in the size of state timber sale programs. State-administered timber sale programs have jurisdiction over state-owned timberland bases ranging in size from 24 million acres (Alaska) to 9,000 acres (Texas). In 2008, individual programs sold as many as 1,182 individual tracts of timber (Minnesota), and as few as 1 tract (Utah). Timber sale programs oversaw annual harvesting activity on 95 acres (Utah) to 57,000 acres (Minnesota) of forest land.

Most of the large programs, as defined by the acres of timberland administered, are located in the Lake States (Michigan, Minnesota, and Wisconsin) and the Pacific Northwest (Alaska, Washington, Oregon, and Idaho). Florida and Pennsylvania are the only other states that administer at least 750,000 acres of state-owned timberland. The remaining states have small to medium sized timber sale programs (less than 750,000 acres of timberland administered), the size of which largely depends on the total area of forest land within the state.

The different types of merchantable species and products sold on state-owned forest land also vary greatly, both within and across geographic regions. In general, western states sell a high proportion of softwood species, with a heavy focus on sawtimber products. Southern states have

a slightly greater mixture of hardwood and softwood species, but softwood species still make up the greatest proportion of timber sales. Sales in the northern US contain the greatest species-product variety. Many timber sale programs in northern states sell hardwood and softwood species, as well as a mix of sawtimber and pulpwood products.

2.3.2. Sources of Direction and Program Goals¹¹

We asked timber sale program supervisors to identify the state constitutional articles, statutory codes, administrative rule chapters, and agency guidelines or manuals that guide the direction of their programs. As expected, most state timber sale programs receive direction from a variety of sources (Figure 2). Almost all are given guidance via statutory code (94%). Agency guidelines and manuals (74%) and administrative rules (56%) are also common sources of direction for program administration. Fifty-nine percent of state timber sale programs receive direction from at least three different sources.

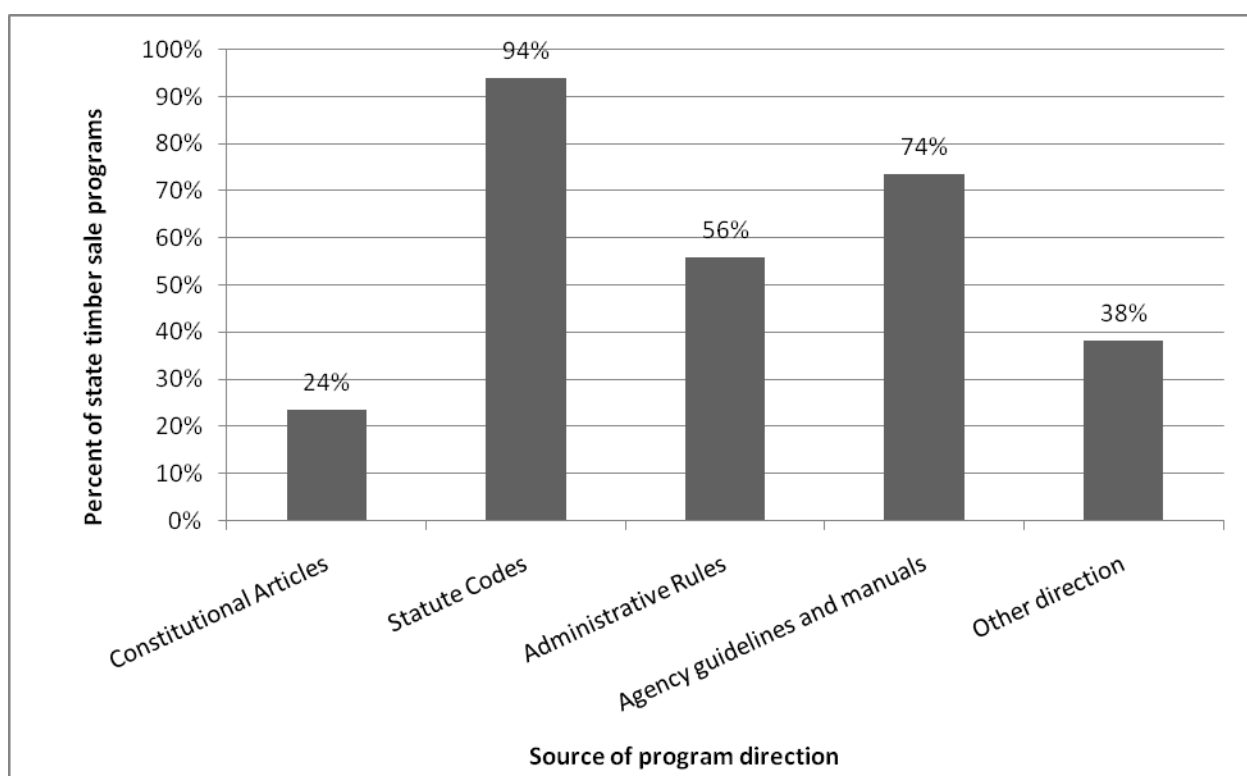


Figure 2. Sources of state timber sale program direction (n=34).

When asked to rate the degree to which each source influences program direction, statutory codes and agency guidelines and manuals are considered at least moderately influential (Figure 3).¹² We also asked supervisors to rate the importance of property management plans. On average, supervisors rated property management plans as moderately important, but slightly less important than state statutes and agency guidelines and manuals. Constitutional articles were the

¹¹ This section discusses responses to question numbers 4, 5, 6, and 7 on the questionnaire (Appendix A).

¹² If a program does not receive direction from a particular source, supervisors were given the option of circling “5 = not applicable”; these responses were re-coded as “1 = no influence” responses.

only source of direction that was typically identified as having little influence on timber sale program operations.

Program supervisors often receive direction from multiple sources. More than two-thirds of program supervisors indicated that three or more different sources of direction have a moderate or major influence on program operations.

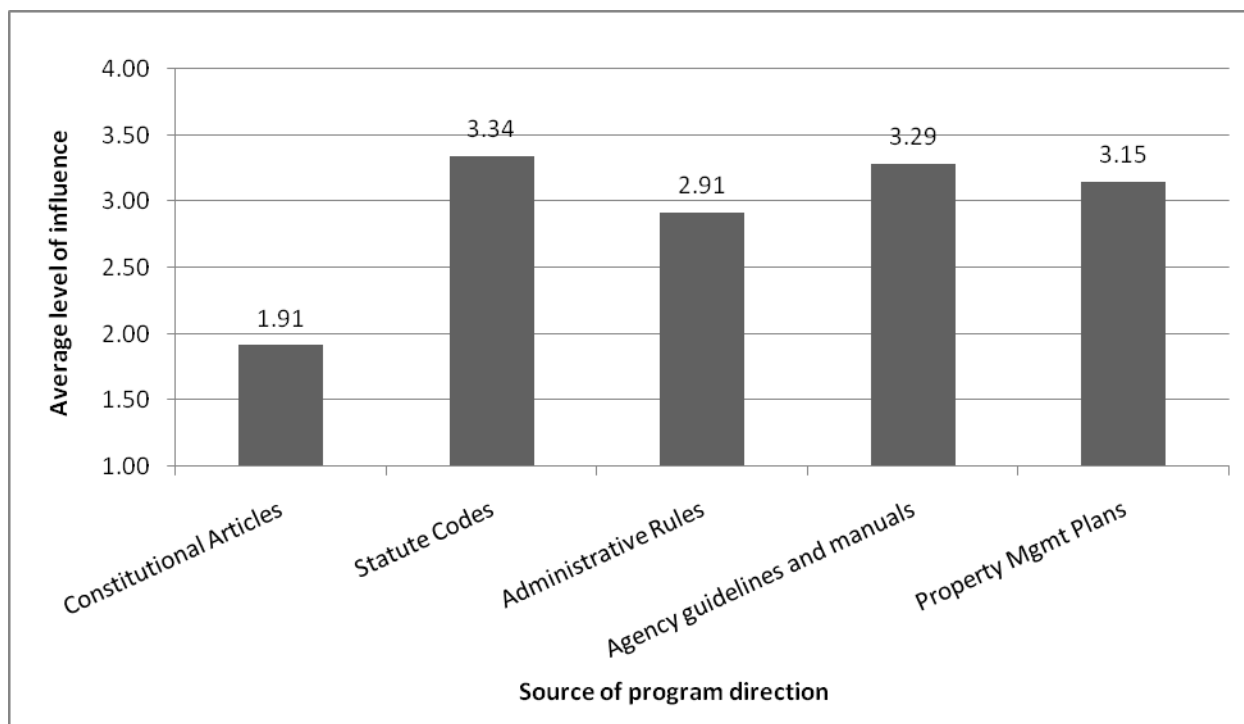


Figure 3. Average level of program influence from different sources of direction (1=no influence, 2=minor influence, 3=moderate influence, 4=major influence; n=35).

Timber sale program supervisors were asked to identify the various timber sale program goals identified in their state’s constitutional articles or statutory codes. Survey responses suggest state timber sale programs are often responsible for achieving many different goals (Figure 4).¹³ More than half of the states have five or more different programatic goals identified in state constitutional articles or statutory codes. State timber sale programs are required to promote, on average, four different goals. In some cases, programs are responsible for achieving all of the goals listed in Figure 4.

Protecting soil quality, enhancing wildlife habitat, improving water quality, and maintaining sustained timber yield are the most common programatic goals identified in state constitutional articles or statutory codes (Figure 4). Of the goals listed in Figure 4, financial return (27%) is the least common goal identified in the state constitution or statute. This contradicts the conventional wisdom which suggest states are often under a trust mandate and fiduciary responsibilities are typically a heavy focus of state forest management activities (Souder and Fairfax 1992).

¹³ When asked if a program goal exists in state constitution or statute, “Not sure” responses were included as “No” responses.

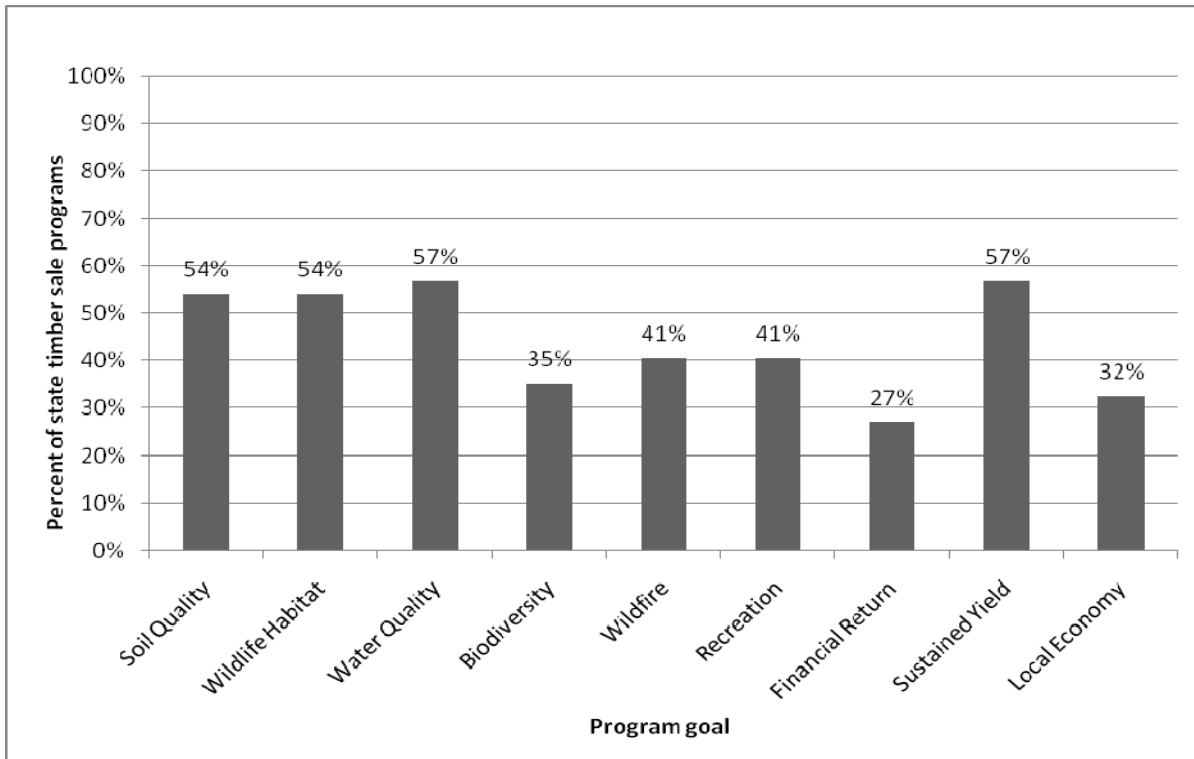


Figure 4. State timber sale program goals identified in state constitutional articles or statutory codes (n=37).

Supervisors were also asked to rate each programmatic goal by level of importance. State timber sale program supervisors believe many goals are important, many of which are not identified in state constitutional articles or statutory codes. On average, each of the goals listed in Figure 5 was considered moderately important to very important. Eighty-nine percent of supervisors identified six or more goals as moderately important or very important.

Responses suggest supervisors feel responsible for achieving many implicit, as well as explicit, timber sale program goals. In other words, important programmatic goals are often not listed in state constitutional articles or codified in statute. For example, generating financial returns is a timber sale program goal identified in only 27% of state constitutional articles or statutory codes, but 81% of supervisors believed it to be a moderately important or very important goal. In states where financial returns are not an explicit statutory goal, 20 out of 25 supervisors (80%) identified financial returns as a moderately important or very important goal. Promoting biodiversity, enhancing recreational opportunities, preventing wildfire, and supporting the local economy were consistently identified as important program objectives, even when they were missing from state constitutional articles or statutory codes.

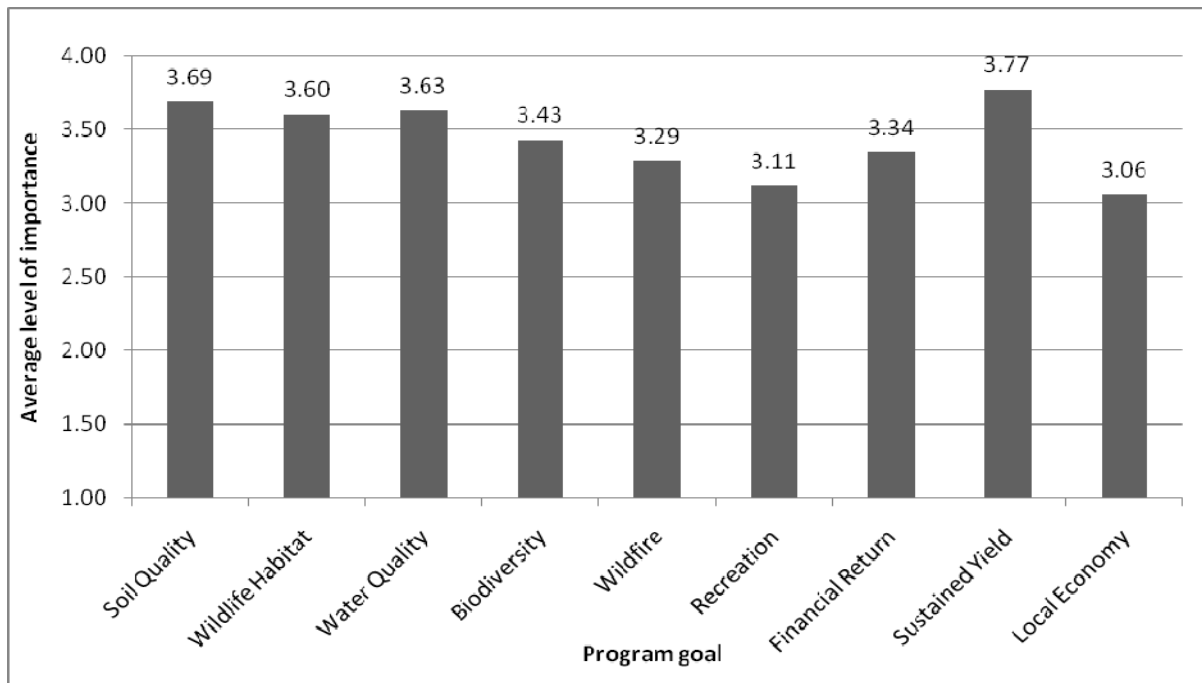


Figure 5. Average perceived importance of various state timber sale program goals (1=not important, 2=minor importance, 3=moderate importance, 4=very important; n=35).

2.3.3. Characteristics of the Surrounding Wood Products Industry¹⁴

The surrounding wood products industry encompasses the companies and individuals that harvest, transport, and use state timber as an input in the production of other goods and services (e.g., board products, paper, lumber, veneer, energy). The characteristics of these companies and individuals, particularly those in close proximity to state-owned forest land, have a significant influence on state timber sale program operations and play a key role in achieving state forest management goals. First, their presence creates a demand for stumpage and, thus, a market for timber sold on state forest land. As a supplier, state timber sale programs consider the needs of their customers when offering tracts of timber for sale. Second, these companies and individuals are needed to conduct many of the on-the-ground forest management activities, such as vegetative management and wildlife habitat improvement projects, to facilitate accomplishing silvicultural objectives. Thus, it is in the best interest of state timber sale programs to design sales that are attractive to potential purchasers and that meet state forest management goals.

State timber sale program supervisors were asked to describe some of the characteristics of the wood products industry in close proximity to their state-owned forest land. First, they were asked to describe the businesses and individuals that purchase timber directly from their state agency. A diverse group of logging businesses, wood product manufacturing companies, and wood brokers purchase stumpage from state timber sale programs (Figure 6). On average, independent logging companies and wood product manufacturers purchase 87% of state stumpage volume. Wood brokers, who purchase approximately 11% of state timber volume, represent the only other significant businesses or individuals purchasing stumpage directly from state agencies.

¹⁴ This section discusses responses to question numbers 15, 16, 17, and 21 on the questionnaire (Appendix A).

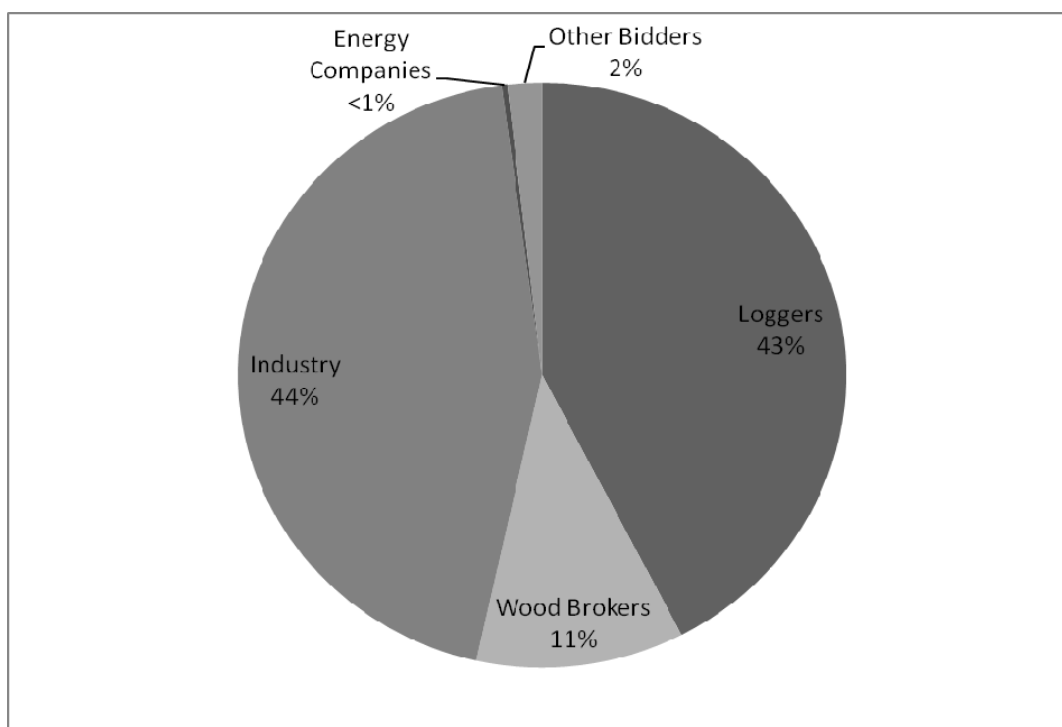


Figure 6. Percent of timber volume purchased from state timber sale programs, by source (n=33).

Supervisors were asked to estimate the percent of timber volume harvested from state-administered land used to produce various types of wood products (e.g., lumber, paper, structural panels, veneer, energy). For an average state timber sale program, approximately half of the timber volume harvested is used to produce lumber (Figure 7). State timber is also used to produce a substantial amount of paper, structural panels, veneer, and energy (including firewood). Viewed from a national perspective, state timber is used to produce a variety of wood products, but most individual states have a limited number of specific product markets. In other words, individual states rarely have substantial product markets for paper, structural panels, lumber, veneer, and energy. Therefore, the variation shown in Figure 7 is much greater than the product market variation found at the individual state level.

Supervisors were asked to estimate approximate transportation distances from the location of their agency's timber sales to wood processing facilities¹⁵. On average, supervisors estimate that 70% of volume harvested on state timber sales is transported less than 100 miles to a processing facility; the remaining 30% is transported 100 miles or more (Figure 8).

Finally, using the approximate number of bidders per tract offered for sale as a proxy, we asked supervisors to estimate the typical level of bidding competition for timber tracts offered for sale at state-administered auctions. Low levels of competition exist for many tracts of state timber offered for sale. In an average program, more than one-third (35%) of timber tracts have two

¹⁵ Since we suspected data would not be available to provide precise answers to questions about transportation distances or bidding competition, we asked supervisors to "estimate" these values. Results from these two questions should be interpreted as supervisors' perceptions, not true transportation distances or levels of bidding competition.

bidders or less (Figure 9). An additional 31% of the timber tracts only have 3-4 bidders. Overall, 66% of timber tracts have four or fewer bidders.

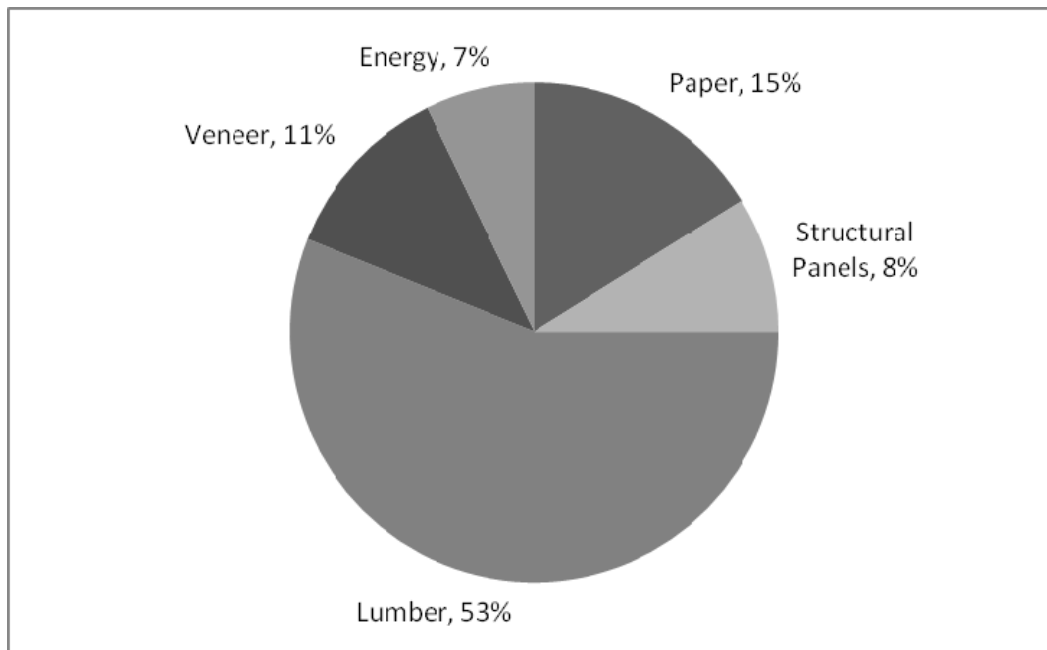


Figure 7. Percent of timber volume sold by state timber sale programs, by wood product manufactured (n=32).

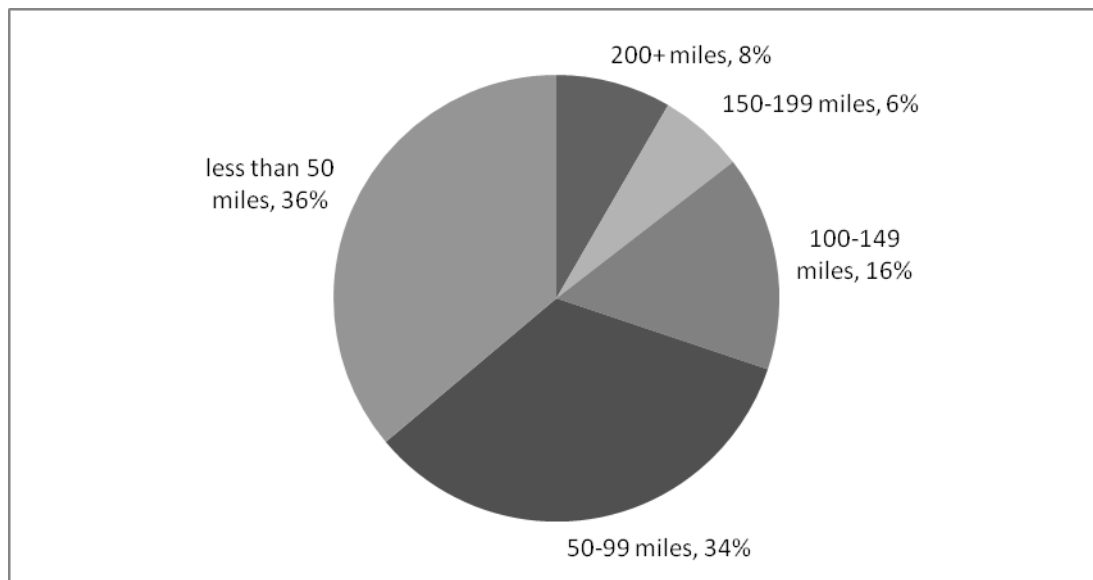


Figure 8. Transportation distances from a state timber sale to processing facilities (% of total sales; n=35).

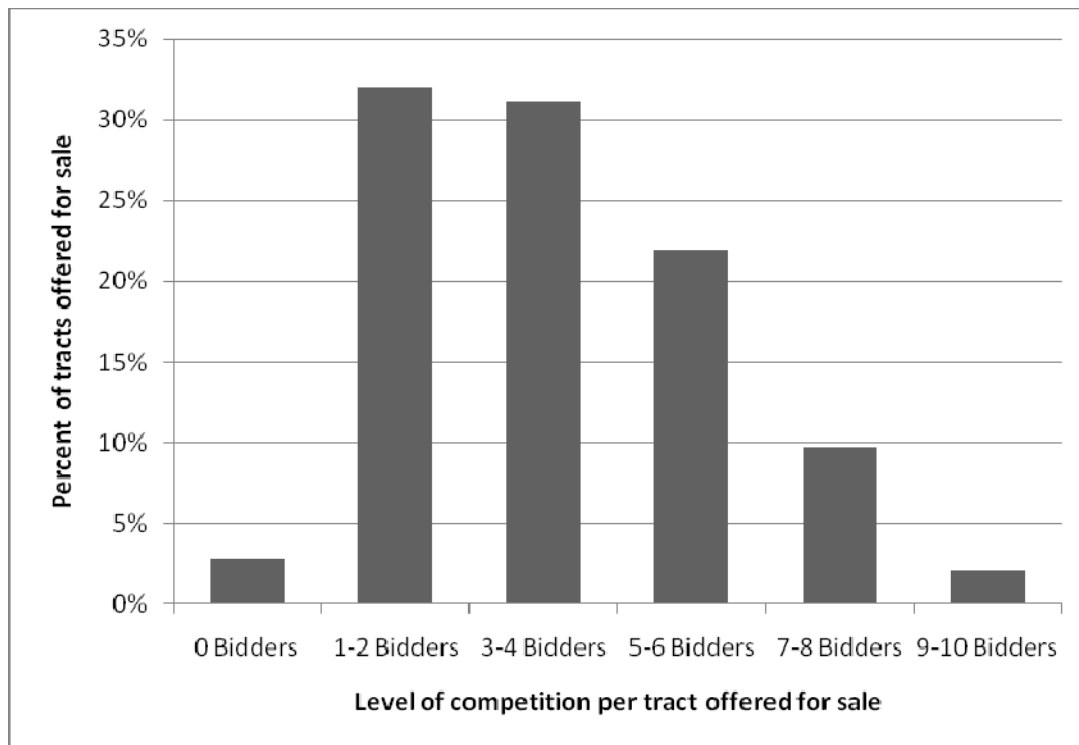


Figure 9. Level of competition for timber tracts offered for sale at state timber sale auctions (% of state timber tracts offered for sale at auctions; n=34).

2.3.4. Methods for Selling Timber

The preceding sections described the physical characteristics of state-owned timberland (Section 2.3.1), the sources of program direction (Section 3.3.2), and the characteristics of the surrounding wood products industry (Section 2.3.3), all of which shape the design and administration of each state agency's timber sale program. However, the primary goal of this study was to assess timber sale program design and administration. In other words, given the previously discussed characteristics of state timber sale programs, what are the methods used for selling timber on state-owned lands? A closer look at these methods may reveal policies and procedures that can be used to improve public timber sale design and administration across the US, and particularly in Minnesota. Recall, we used individual state programs as the unit of analysis to describe an average state timber sale program.

2.3.4.1. Auction methods¹⁶

Auctions are used to sell many goods and services in the US. They are a particularly popular tool when selling publically owned natural resources such as timber. The four most widely used and analyzed auction methods are: (1) the first-price sealed bid auction where bidders submit single bids and the object is awarded to the highest bidder at the highest bid price; (2) the second-price sealed bid auction where bidders submit single bids and the object is awarded to the highest bidder at the second highest bid price (i.e., Vickrey auctions); (3) the ascending-bid auction where the price is raised successively until only one bidder remains and the bidder wins the object at the final price; and (4) the descending-bid auction where the price is successively

¹⁶ This section discusses responses to question numbers 18 and 19 on the questionnaire (Appendix A).

lowered until a bidder indicates a willingness to purchase the object at that price (i.e., Dutch auctions) (Klemperer 1999). Federal agencies typically use first-price sealed bid auctions to sell timber. However, prior to this study, very little information existed about the auction method used by state timber sale programs.

State timber sale program supervisors estimated that, on average, 76% of state timber volume is sold through an auction process; the remaining timber volume is sold at negotiated or advertised prices. Supervisors were asked to describe the auction method used to sell state timber at a public auction. The auction methods used by an average state timber sale program are shown in Figure 10. First-price sealed bid auctions are the dominant auction method (91%) and ascending-bid auctions are rarely used by state timber sale programs. State timber sale programs do not use second-price sealed bid auctions or descending-bid auctions.

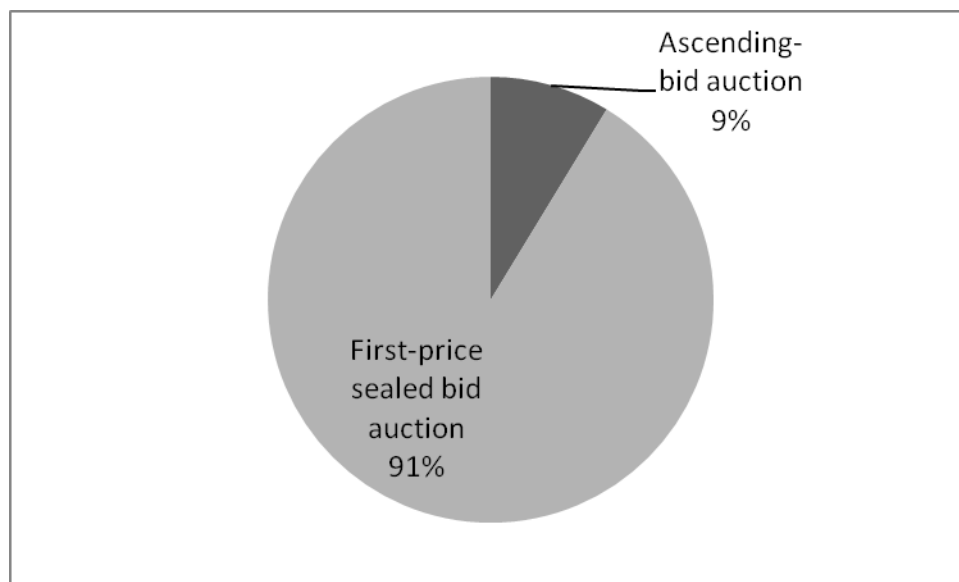


Figure 10. Auction methods by state timber sale programs (% of total tracts offered for sale through an auction process; n=34).

2.3.4.2 Contract length¹⁷

Supervisors were asked to describe the length of time purchasers are allowed to wait before they are required to harvest the timber sale—otherwise known as “contract length.” Nearly 86% of the state timber sale stumpage volume is sold with a contract length of two years or less; only 6% of sale contracts are longer than three years (Figure 11).

As a follow-up question, supervisors were asked to describe the penalties assessed when stumpage purchasers require a contract extension. Many states do not penalize stumpage purchasers for contract extensions. Of the states that have a penalty, the most common policy is to charge a predetermined interest rate (typically 5 to 10%) for stumpage to be harvested during the extension period. Other common procedures are to reappraise the price of the remaining timber to reflect current prices, or to require purchasers to pay for the remaining timber before the

¹⁷ This section discusses responses to question numbers 34, 35, and 36 on the questionnaire (Appendix A).

extension is granted. Other state penalties include charging an administrative fee, requiring an additional performance bond, and adjusting prices by current interest or inflation rates.

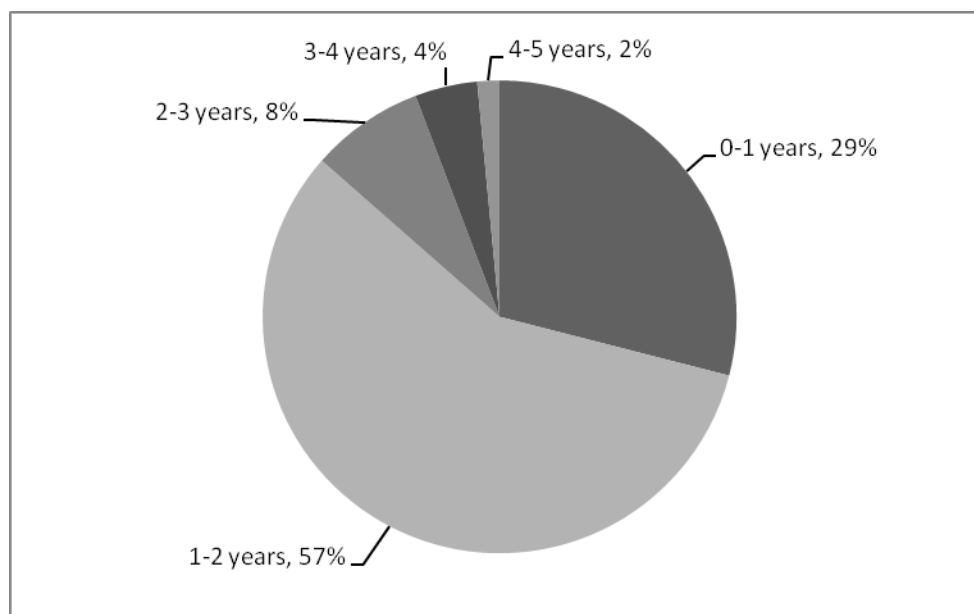


Figure 11. Contract length for timber tracts sold by state timber sale program (% of total tracts offered for sale; n=37).

2.3.4.3. Appraisal methods and reserve prices¹⁸

State timber sale program supervisors were asked to describe their methods for estimating the value of timber offered for sale (appraised value). States typically estimate appraised values using one or both of the following methods: (1) use actual previous timber sales that contain similar characteristics to estimate the value of current sales; or (2) subtract estimated harvest and transportation costs from delivered wood prices to estimate the value of standing timber¹⁹. Both methods incorporate a variety of site-specific adjustment factors such as topography, soils, harvest density, hauling distance, quality of wood, and access characteristics into the determination of appraised timber values.

We also asked about states' processes for setting reserve prices—the minimum bid they would be willing to accept for a timber sale. Reserve prices are often based on appraised values. Approximately half of state timber sale programs set reserve prices equal to appraised timber values. In other programs, reserve prices are a fraction of appraised value, usually 50-90%. This practice is typical in auction settings, as sellers set reserve prices lower than the estimated appraised value in order to attract bidders and increase the probability of sale. In order to ensure positive cash flow, one state sets reserve prices equal to the cost of administering the sale. While most states utilize reserve prices, a few states do not. Three states do not advertise reserve prices, but they maintain the right to reject low bids.

¹⁸ This section discusses responses to question numbers 24, 30, and 31 on the questionnaire (Appendix A).

¹⁹ The former method falls into a category called a transactional evidence approach (TEA) and the latter method is often called a residual value approach.

2.3.4.4. Small business opportunities²⁰

Some public agencies reserve a portion of their timber sales and make them available to smaller businesses only. For example, the USDA-FS's set-aside sale program restricts bidding to firms with less than 500 employees (Weiner 1979). Also, the MN DNR sells much of its timber using "intermediate sales." Intermediate sales are different from regular sales in that they must contain less than 3,000 cords, are only available to firms with no more than 20 employees, and an individual firm cannot purchase more than 25% of the tracts offered for sale on the first round of bidding at a particular sale²¹. These restrictions are meant to give smaller firms more opportunities to purchase stumpage. We were interested in whether similar small business opportunities existed within other state programs.

We asked supervisors to describe any procedures used by their program to restrict participation in a way that increases opportunities for smaller businesses to purchase public timber. With the exception of Minnesota, states do not have formal sale procedures used to offer timber to smaller businesses. A few states negotiate small sales with local contractors or make an effort to set-up sales geared toward smaller operators. In several states, individuals may purchase over-the-counter permits, which are sold at appraised prices without bidding. However, no other state has a policy that resembles Minnesota's intermediate timber sale process.

2.3.4.5. Access and roads²²

We asked state supervisors to identify whether the state agency or the purchaser of the timber is responsible for securing access rights to a tract across adjacent private lands. Responses indicated that the responsibility for securing access across adjacent private forest lands is closely split between state forestry agencies (44%) and timber sale purchasers (39%) (Figure 12). In some states, the state forestry agency and the sale purchaser are both responsible for securing access.

We also asked supervisors to identify whether the state or the sale purchaser is responsible for paying the costs associated with new road construction needed to access a tract of timber. States have diverse policies regarding who has the burden of paying for road construction costs. On average, respondents indicated the purchaser is responsible for paying 58% of the costs associated with constructing roads to access state timber sales and the state pays for the remaining 42% (Figure 13).

²⁰ This section discusses responses to question numbers 39 and 40 on the questionnaire (Appendix A).

²¹ A round of bidding occurs at an auction meeting where several tracts are offered for sale. After all tracts have been offered for sale at the auction, the tracts that did not receive a bid during the first round of bidding are reoffered on a second round of bidding.

²² This section discusses responses to question numbers 43 and 44 on the questionnaire (Appendix A).

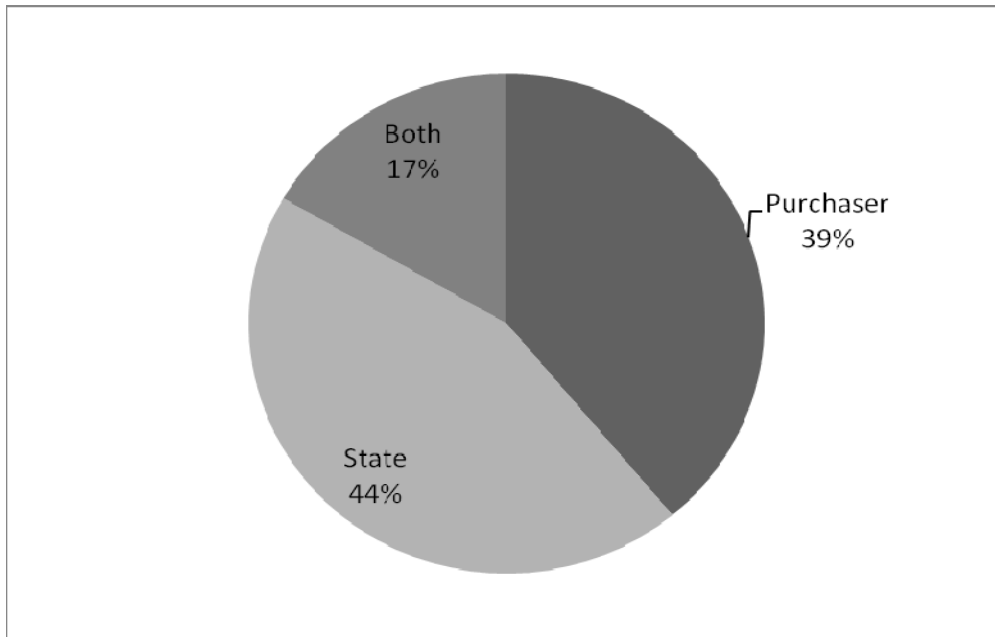


Figure 12. Responsibility for securing access to sales across private land (% of total sales requiring access across private land; n=36).

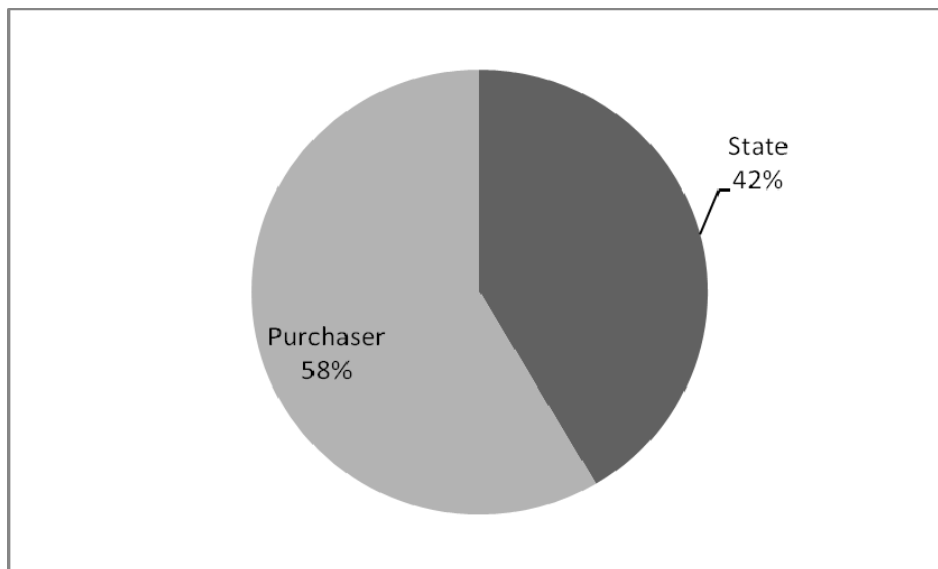


Figure 13. Responsibility for expenses associated with new road construction needed to access state timber sales (% of total road construction costs need to access state timber sales; n=33).

2.3.4.6. *Payment method (lump sum vs. log-scale)*²³

We asked supervisors to identify the method by which their agency collects timber sale payments: lump sum or log-scale. In a lump-sum sale, the purchaser agrees to pay a specific amount for the entire tract of timber, regardless of the amount actually removed from the tract.

²³ This section discusses responses to question number 45 on the questionnaire (Appendix A).

Lump-sum sales are sometimes referred to as tree measurement or sold on appraised volume (SOAV) sales. In a log-scale sale, the volume of wood removed from the tract is measured (scaled) by the seller or a third party and the purchaser agrees to pay a specific amount for each unit of merchantable volume removed. Log-scale sales are often called scaled sales or pay-as-cut sales.

Lump sum payment methods (63%) are used more often than log-scaling (37%), but both methods are common (Figure 14). Many states use a mix of lump sum and scaled payment methods. Two state timber sale programs occasionally give the purchaser the option to choose whether they would like to make lump sum payments or log-scale payments.

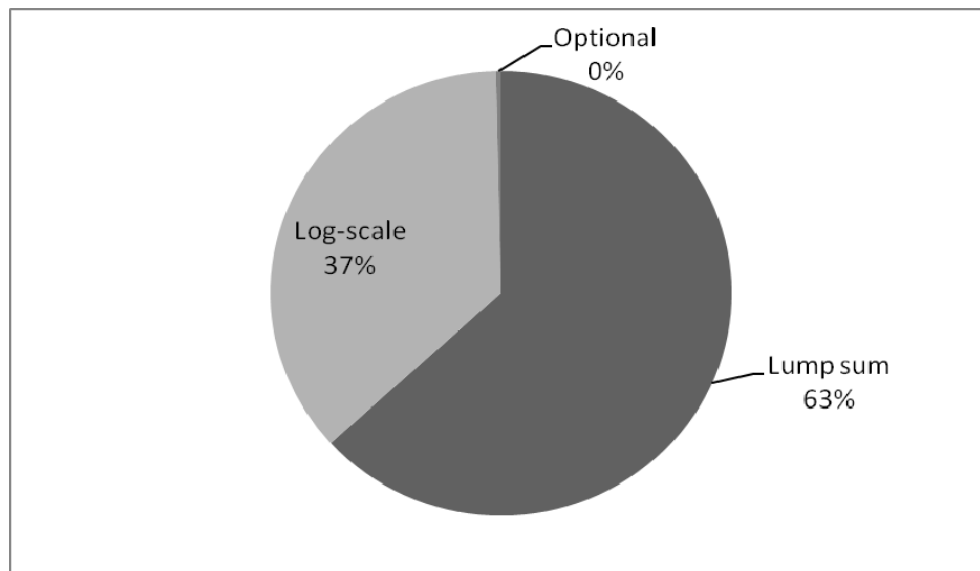


Figure 14. Payment method for state timber sales (% of total sale volume; n=37).

2.3.5. Recent Program Changes and Opportunities for Improvement

2.3.5.1. Recent changes²⁴

Supervisors were asked to describe any major changes made to the methods used to sell state timber over the last 10 years, including auction methods, payment methods, contract provisions, or responsibilities for securing sale access. The following section summarizes their responses. Not all recent changes made to state timber sale programs are discussed; only those that were made in two or more state timber sale programs and changes we believed were unique or innovative.

State supervisors frequently identified changes in contractual timber sale language. State timber sale contracts now include more detailed language about liability and insurance coverage, log grading specifications, safety and best management practice requirements, logger training requirements, and penalties for contract violations. Multiple supervisors also indicated that, due to the length and complexity of these contracts, the timber sale approval process was arduous and

²⁴ This section discusses responses to question numbers 22, 32, 37, 40, 44, 48, and 50 on the questionnaire (Appendix A).

slow. Therefore, opportunities to develop a faster and more efficient timber sale contract approval process likely exist.

Another recent change was a transition from ascending-bid oral auctions to first-price sealed bid auctions. Two states recently increased the proportion of sealed bid auctions, but for different reasons. One state required more sealed bid auctions in an attempt to reduce exorbitant bidding; the other switched to sealed bids to reduce the likelihood of bidder collusion. A supervisor from a third state expressed interest in using more sealed bid auctions in low competition areas.

Several states have made changes to increase timber availability for small businesses. States have reduced capital investment requirements (e.g., down payments, bid deposits, performance bonds) at the time of purchase. Other states have reduced the size of tracts offered for sale (e.g., fewer acres) or individual cutting blocks.

At least two states have implemented, or piloted, a “log sort” sale program. Instead of selling stumpage, the state hires loggers to harvest and transport timber to a landing or a state-owned wood lot. The state sorts the wood and allows purchasers to bid on specific sorts. Supervisors in these states had positive comments about this process. They believe it has potential to capture additional value for the state.

Several programs made recent changes to improve their ability to track harvest loads and bill purchasers for these loads. The changes primarily came in the form of upgrades to computer software used to track harvests and bill purchasers. Other supervisors who have not made such upgrades identified opportunities to enhance operation efficiency through similar technological upgrades to their program’s electronic accounting systems.

Finally, one state recently developed a system for selling timber that appears to be unique within state programs. They utilize 5-year agreements in which large timber sale volumes are guaranteed. However, the specific location of tracts is only known for the first 1 to 2 years of the contract; the location of the remainder of the volume to be harvested in years 3 to 5 is unknown at the time the agreement is purchased. According to the program supervisor, this long-term stumpage sale system was used “to encourage contractors to acquire desirable equipment and to foster supervision efficiency.”

2.3.5.2. Opportunities for improvement²⁵

Supervisors were also given an opportunity to identify any potential changes they believe would improve program effectiveness or efficiency. This section presents a summary of their responses. Similar to our discussion of recent program changes, we focus our attention on those opportunities identified by two or more supervisors²⁶.

²⁵ This section discusses responses to question numbers 23, 33, 38, 41, 49, and 50 on the questionnaire (Appendix A).

²⁶ Unfortunately, on the survey itself very few supervisors identified opportunities for program improvements. While this may mean that they really do not have any ideas for improving their program, we suspect the length of the questionnaire, along with the open-ended nature of the questions, caused a low response rate. For this reason, we conducted follow-up focus groups with many of the supervisors to gather more in-depth information about opportunities for program improvements (see Section 3).

Several supervisors believe their state's timber sale approval and administration (e.g., billing and accounting) process could be improved. For example, one supervisor said an individual timber sale needs ten different approval signatures. Another supervisor indicated the technology used to track sale loads and bill stumpage purchasers needs to be enhanced. Both examples identify opportunities to improve the administrative efficiency of state timber sale programs by upgrading the technology or streamlining the timber sale approval process.

Other supervisors suggested changes to capital investment requirements or performance deposits. Interestingly, states disagreed as to whether these requirements should increase or decrease. Some states wanted to reduce down payments to attract smaller bidders who have limited capital. Other states wanted to increase down payments or performance deposits in order to discourage sale defaults and encourage timely timber harvests.

Supervisors suggested many other changes that would improve program operations. Some of these suggestions included: find ways to eliminate "bad actor" loggers, negotiate sale terms and conditions on a case-by-case basis, utilize an electronic (online) bidding process, utilize Dutch auction methods, increase sealed bid auctions in areas with low competition, and hire loggers to harvest and transport wood to a landing where it is then sold by the state (i.e., log sort sales).

2.4. Summary and Conclusions

Survey responses from state timber sale program supervisors were used to describe the national landscape of state timber sale programs, including the physical characteristics of state-administered timberland, sources of timber sale program direction and program goals, wood products industry in close proximity to state-owned land, and methods used to sell state-owned timber. Supervisors also identified recent program changes and opportunities for improvement.

2.4.1. Physical Characteristics of State-Administered Timberland

The physical characteristics of state-administered timberland are extremely diverse. A "typical" state timber sale program does not exist. The size of state-administered timberland, the annual area harvested, the annual number of timber sales administered, and the species-product composition vary considerably between states. These differences can be attributed to the unique historical, economic, political, and environmental characteristics in each state.

2.4.2. Sources of Direction and Program Goals

State timber sale programs typically receive direction from a variety of sources, including state statutes, administrative codes, and agency guidelines or manuals. The many sources of direction may lead to potentially conflicting program goals. The average timber sale program is expected to meet at least four separate goals codified in state statute. The most common state timber sale program goals are to protect soil quality, enhance wildlife habitat, improve water quality, and generate a sustained timber yield. Contrary to the conventional wisdom, only 27% of state programs are required by state constitution or statute to generate financial returns.

State timber sale program supervisors believe their programs are responsible for achieving a variety of important programmatic goals, many of which are not explicitly identified in state statute. Supervisors identified soil quality, wildlife habitat, water quality, and sustained timber yield as the most important state timber sale program goals. However, generating financial

returns, promoting recreational opportunities, and supporting the local economy are also considered important program goals, regardless of whether they are included in state statutory language. This perceived responsibility to meet all possible goals may make it difficult for program administrators to identify clear priorities in instances when goals are mutually exclusive.

2.4.3. Characteristics of Surrounding Wood Products Industry

A diverse group of logging businesses, wood product manufacturing companies, and wood brokers purchase stumpage from state timber sale programs. On average, independent logging companies and wood product manufacturers purchase nearly 90% of state stumpage volume and approximately half of the volume is used to produce lumber; the rest is primarily used to produce paper, structural panels, veneer, and energy (including firewood).

Competition for state timber sales is frequently very low. Supervisors estimated that more than one-third of state timber sales have two bidders or less and two-thirds of sales had less than five bidders. The low level of competition is likely related to a lack of wood product processing facilities in close proximity to state-owned forest land. A substantial portion of timber sold on state-owned land is transported long distances to processing facilities. State timber sale supervisors estimated that 30% of the timber volume harvested on state-administered forest land is transported 100 miles or more. Low competition should be a concern for many state timber sale programs. Previous studies suggest that low competition leads to lower stumpage prices (Buongiorno and Young 1984; Dahal and Mehmood 2005; Leefers and Potter-Witter 2006), thus lower gross timber sale revenue.

2.4.4. Methods for Selling Timber

Survey results were also used to describe the policies and procedures used to sell state timber. We identified several key state timber sale methods that are common across most timber sale programs, as well as methods that frequently vary between and within states. We also identified important recent program changes and opportunities for program improvements.

2.4.4.1. Methods frequently used to sell state timber

Programs develop policies and procedures over time that reflect the physical, political, and economic conditions unique to each state. Our survey identified policies and procedures that are common amongst most timber sale programs. This high level of frequency does not necessarily imply a superior method of sale. However, to some degree, it may reveal a preference for certain methods by individuals responsible for timber sale program design and administration in each state.

Contract length. A review of state timber sales around the country suggests that three to five year contracts are extremely rare. States typically give purchasers two years or less to harvest timber sales. Nearly 86% of stumpage volume is sold with a contract length of two years or less; and only 6% of sale contracts are longer than three years. One or two year contracts appear to be the standard. An important reason for shorter contract length is to get silvicultural work done quicker.

Auction methods. First-price sealed bids are the dominant auction method, while ascending-bid auctions are rarely utilized. State timber sale programs do not conduct second-price sealed bid auctions (i.e., Vickrey auctions) or descending-bid auctions (i.e., Dutch auctions).

Much of the existing timber sale auction literature suggests first-price sealed bid auctions are preferred over ascending-price auctions if the seller wishes to generate higher gross revenue. First, sealed bid auctions typically elicit higher prices, especially in areas of low competition (Johnson 1979; Weiner 1979; Haynes 1980; Hansen 1986). In addition, sealed bid auctions eliminate preclusive bidding and reduce the likelihood of collusion (Brannman 1991). Almost all state timber sale programs have adopted the first-price sealed bid auction method, which suggests the individuals designing and administering these programs are aware of these advantages. In addition, most of the supervisors in the states that currently utilize ascending-bid auctions expressed a desire to use more first-price sealed bids.

Small business opportunities. Minnesota is the only state timber sale program with formal sale procedures used to offer tracts of timber for sale to smaller business. Several states negotiate small sales with local contractors or make an effort to set-up small tracts of timber specifically directed toward smaller operators. However, no other states have policies that resemble Minnesota's intermediate timber sale process. A renewed look at the impacts of Minnesota's intermediate timber sale process may be needed to help re-evaluate its effectiveness as a tool to achieve program goals.

2.4.4.2. Diverse methods used to sell state-owned timber

For many other policies and procedures, the methods used to sell state timber vary greatly. For example, states use a wide variety of methods to estimate appraised timber values and set reserve prices. States also use a mix of lump sum and log-scaling payment methods. The responsibility for securing timber sale access across adjacent private lands and constructing new roads for timber sales frequently varies between and within programs. In some cases, the burden falls primarily on the state; in others the timber sale purchaser is responsible.

Two important factors may contribute to this variation. First, policymakers may be unaware of the most efficient and effective method of sale. Therefore, more research on the relative efficacy of these methods may help elucidate the relative advantages of each and, ultimately, improve timber sale program design. A second more likely explanation is that the efficacy of these methods depends on the environmental, political, or economic conditions unique to each state. Each method has advantages. Thus, individual programs should continue to tailor their timber sale design and administration to utilize these advantages in a way that maximizes program effectiveness.

2.4.4.3. Opportunities for improvement

Survey responses revealed opportunities to make improvements to state timber sale programs. One clear opportunity exists in the area of auction methods. Most state timber sale programs currently utilize first-price sealed bids. Many of the supervisors of state timber sale programs that currently use ascending-price bids believe a first-price sealed bid process would be a significant improvement. In addition, no state timber sale programs utilize Vickrey or Dutch

auctions methods. It may be worthwhile to explore any potential gains in efficiency associated with these methods.

Supervisors also frequently commented on technology upgrades. States that recently upgraded their billing and accounting systems were able to improve program operation effectiveness. Many other states identified technological upgrades as a potential opportunity to enhance administrative efficiencies.

A couple of states utilize log sort sale methods—a process whereby the state hires loggers and truckers to harvest the stumpage and transport it to a location where it is sorted by the state and sold to purchasers. Supervisors from states that have used this method reported positive results. They believe the method allows the state to capture additional value from the timber.

Supervisors also expressed concerns over recent changes to their state programs' timber sale contract language and approval process. Timber sale contracts are becoming increasingly complex. Additionally, the process needed to approve a state timber sale can be long and arduous. These changes often increase program costs and reduce administrative efficiency. Policy-makers and program administrators should be aware of this potential problem as state timber sale programs continue to evolve in an effort to meet new goals.

3. Barriers to Effective State Timber Sale Program Administration: A Qualitative Assessment

3.1. Introduction

Programs with the responsibility for administering state timber sales vary greatly, as each state's program is a unique collection of policies, processes, and contract provisions (see Section 2). However, previous research provides little published guidance about the attributes of effective state timber sale program administration. Past research has addressed other state-level forest related programs, such as state environmental review policies and procedures (Ma et al. 2009), encouraging the application of best management practices (Kilgore and Blinn 2004), monitoring the application of best management practices (Phillips and Blinn 2007), state forest resource planning (Kilgore et al. 2006) and state forest practice regulatory frameworks (Ellefson et al. 2006). Considerable attention has been paid to the policies and procedures governing the administration of federal timber sale programs (e.g., Clawson 1976; Barlow et al. 1980; Maroaka and Watson 1983). Yet, research on the administration of state timber sale programs has been largely ignored. Specifically, we were not able to find research examining the issues and problems facing state timber sale programs across the country. Souder and Fairfax (1992) provide a comprehensive review of state forest land management; yet they restrict their analysis to states in the western US and do not discuss specific timber sale policies and programs. To date, Section 2 of this study represents the only attempt to provide a complete description of the different timber sale programs across the country. Section 2 showed considerable variability between state timber sale programs. Each state timber sale program is unique in its size, physical characteristics, sources of program direction, goals and objectives, contract provisions, and methods for selling timber. While results from the survey helped describe the wide variety of

state timber sale policies and programs that exist across the country, a more in-depth understanding of the problems and issues facing state timber sale programs is needed.

The purpose of this portion of our study was to identify and describe common barriers to effective administration and practical opportunities to improve the design and implementation of public timber sale programs across the country. More specifically, we wanted to develop a greater understanding of key program attributes, barriers to efficient timber sale program administration, and opportunities for state timber sale program improvements. To do this, we used telephone focus group methodology to collect qualitative information about various issues surrounding state timber sale program administration.

3.2. Study Population

The study population was individuals with lead responsibility for supervising programs that sell timber on state-owned forest land (state timber sale program supervisors). We chose state timber sale program supervisors because we felt they offered unique and valuable insight on public timber sale program design and implementation. These individuals deal with timber sale program administration matters on a daily basis and have expert knowledge of the policies, procedures, and contract provisions used to set-up and administer state timber sales. They are also keenly aware of the problems, issues, and barriers affecting the administration of their agency's timber sale program. Therefore, we believe these supervisors are the most "information rich" population by which to obtain perspectives on state timber sale program administration.

Through a series of exploratory telephone calls to state forestry agencies, we identified 43 states that currently conduct timber sales on state-owned land. Across these 43 states, we identified 46 state agencies that are responsible for administering state timber sale programs. We also identified and targeted the individual within each state timber sale program who had lead responsibility for supervising program operations.

3.3. Data and Methods

Since little was known about many of the issues and problems facing state timber sale programs across the country, we utilized qualitative focus group methodology to collect data from state timber sale program supervisors. According to Krueger and Casey (2009, p. 2), a focus group study is "a carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment." Focus groups are a particularly useful method of data collection for exploratory research where little is known about the phenomenon of interest (Stewart and Shamdasani 1990, p. 15). In the case of our study, we were unaware of any previously published research that examined, in detail, state timber sale program administration. Another advantage of using focus group methodology is that it allows respondents to react to and build upon the responses of other group members (Stewart and Shamdasani 1990, p. 15). We felt this synergistic effect might elicit ideas and thoughts on state timber sale program administration and related issues that might not otherwise be ascertained through individual interviews.

The large geographic distance separating many supervisors and their relatively small population made a series of in-person focus groups logistically improbable to schedule within the framework of this study. Therefore, we felt the best way to attract an adequate number of study

participants was to conduct the focus groups over the telephone. While we were unable to find examples of telephone focus groups used in other natural resource research, they have been successfully utilized in public health research (Cooper et al. 2003) and have existed in consumer research since the 1960s (McGee 1997). Telephone focus groups present certain disadvantages relative to in-person focus groups, namely the absence of nonverbal communication and the potential for limited group interaction. However, a review of telephone focus groups found that they are often a useful method to increase participation rates and reduce costs where the study population is geographically disparate (Ross et al. 2006).

Potential focus group participants were identified through a mail-back questionnaire sent to the nation's 46 state timber sale program supervisors approximately four months prior to conducting the focus groups. The questionnaire was used to collect information about the policies, procedures, and contract provisions used by state timber sale programs across the country (see Section 2). Thirty-seven questionnaires were returned (80% response rate) and 22 respondents indicated that they would be, or might be, willing to participate in a follow-up telephone focus group with other state timber sale program supervisors. After soliciting information on the availability of these individuals to participate in a focus group, timber sale program supervisors from 15 states accepted invitations to participate in a telephone focus group. Information on those state timber sale programs is presented in Table 4.

Three focus groups were conducted during July 2009. Focus group participants were placed into one of three groups (one group of six, two groups of five) using two major criteria: state timber sale program size and supervisor availability. We hypothesized that program issues and barriers to effective administration would vary with program size (e.g., acres managed, number of sales per year, volume sold per year). Unfortunately, due to scheduling conflicts, we were unable to group strictly by program size. Instead, we scheduled one focus group that contained only large timber sale programs, based on area of timberland administered (i.e., the state contains at least 780,000 acres of state-administered forest land), and two focus groups of supervisors of primarily medium and small state timber sale programs. One member of the research team moderated the focus group and three additional team members took notes of the conversation.

Following published recommendations for telephone focus groups (Krueger and Casey 2009), we e-mailed focus group participants the list of discussion questions two days prior to the focus group (Appendix B). Logistically, the focus groups resembled a standard conference call in that individuals dialed a toll-free number at a pre-arranged time in order to participate. A record of each focus group was captured using paper field notes and digital audio files. Each focus group lasted approximately 90 minutes.

The moderator began each focus group with an introduction that described the purpose of the study and focus group ground rules (e.g., participants should identify themselves before speaking, each group will last an hour and a half, groups were being digitally recorded, and individual comments will be kept anonymous in any written materials summarizing the discussion). The discussion started with each supervisor describing the major policies and procedures utilized by their state agency's timber sale program (e.g., auction methods, contract provisions, payment methods). Following these overviews, the moderator used the following

Table 4. Description of state timber sale programs supervised by focus group participants.

State Agency	Timberland administered*	2008 stumpage volume sold	Auction method(s)	Payment method(s)
Arkansas Forestry Commission	21,000 acres	3,276 MBF	100% sealed	85% lump-sum 15% log-scale
Colorado State Forest Service	400,000 acres	Not available	100% sealed	80% lump-sum 20% log-scale
Florida Division of Forestry	1,043,685 acres	1,376,345 green tons	100% sealed	60% lump-sum 40% log-scale
Idaho Department of Lands <i>Forest Management Bureau</i>	1,035,253 acres	222,000 MBF	100% oral	4% lump-sum 86% log-scale 10% optional
Maine Department of Conservation <i>Bureau of Parks and Lands</i>	400,000 acres	101,000 cords	100% sealed	100% log-scale
Massachusetts Dept. of Cons. and Rec. <i>Division of Water Supply Protection</i>	100,000 acres	6,050 cords 3,900 MBF 9,900 green tons	100% sealed	100% lump-sum
Minnesota Dept. of Natural Resources <i>Division of Forestry</i>	3,000,000 acres	1,104,023 cords 8,759 MBF 46,450 green tons	14% sealed 86% oral	6% lump-sum 92% log-scale 2% optional
Ohio Department of Natural Resources <i>Division of Forestry</i>	190,000 acres	8,010 MBF 22,266 green tons	100% sealed	90% lump-sum 10% log-scale
Oregon Department of Forestry	780,000 acres	214,000 MBF	100% sealed	1% lump-sum 94% log-scale 5% other
Pennsylvania DCNR <i>Bureau of Forestry</i>	2,100,000 acres	9,901 cords 48,588 MBF 3,118,000 cubic ft	100% sealed	100% lump-sum
South Carolina Forestry Commission	430,000 acres	1,102 cords 1,700 MBF	100% sealed	50% lump-sum 50% log-scale
Vermont Dept. of Forests, Parks, and Rec.	360,000 acres	2,133 cords 1,563 MBF	100% sealed	90% lump-sum 10% log-scale
Virginia Department of Forestry	59,000 acres	25,880 cords; 2,197 MBF	100% sealed	60% lump-sum 40% log-scale
Washington Dept. of Natural Resources <i>Forest Practices Division</i>	2,100,000 acres	660,360 MBF	100% sealed	55% lump-sum 35% log-scale 10% other
Wisconsin Dept. of Natural Resources <i>Division of Forestry</i>	930,000 acres	240,000 cords 6,324 MBF	100% sealed	25% lump-sum 75% log-scale

*State administered timberland was defined as land where: (1) the state owns fee title; (2) state agencies are responsible for managing the land; (3) at least 20 cubic feet of wood per year is capable of being grown; and (4) timber harvests are legal.

open-ended questions to guide the supervisors through a discussion about state timber sale program administration.

- What do you consider to be some of the effective procedures utilized by your state agency's timber sale program?

- What are the major problems or issues that create barriers to effective program administration?
- What are some potential improvements that could be made to your state's program to increase effectiveness or efficiency?

After discussing these key questions, participants were asked to identify the top three changes they would make to their program if they were able to do so. We reserved the last few minutes of the focus group session to give participants an opportunity to ask clarifying questions or provide final comments.

We used a computer-based version of the classic analysis strategy described by Krueger and Casey (2009) to analyze focus group field notes and transcripts. Immediately following each focus group, research team members debriefed and identified emerging themes. Also, within a day of each focus group, the field notes were collated into a list of responses to each discussion question. After transcribing each interview, focus group participant quotes were categorized and pasted into a Microsoft Word document for each discussion question. Using results from the debriefing session and field notes, quotes were further categorized into common themes for each discussion question.

After participant comments were summarized and categorized by key discussion question, the research team identified important themes that existed across multiple questions. All quotes were subsequently re-categorized by these cross-question themes, which then provided the basis for the research team to further refine and clarify the thematic categories through an iterative process. The final themes were confirmed and verified by all members of the research team.

3.4. Findings

Key focus group findings were divided into two major areas: (1) perspectives on key state timber sale program attributes; and (2) issues, problems, and barriers to effective program administration. Many topics were discussed over the course of the three focus groups, but the following discussion highlights the most prominent themes that reoccurred throughout the three focus group meetings.

3.4.1. Perspectives on Key Program Attributes

Participants were asked to describe effective policies and procedures used by their state's timber sale program. This question was open-ended. However, two key program attributes were of particular interest to our research team: the methods by which buyers pay for state timber (i.e., lump-sum vs. log-scale) and the method by which the timber is auctioned (i.e., ascending price vs. first-price sealed bid). We were interested in obtaining supervisors' perceptions about, issues with, and preferences toward these key program attributes.

3.4.1.1. Payment method (lump-sum vs. log-scale)

The two common timber sale payment methods are lump-sum and log-scale. In a lump-sum sale, the purchaser agrees to pay a specific amount for the entire tract of timber, regardless of the amount actually removed from the tract. Lump-sum sales are sometimes referred to as tree measurement or sold on appraised volume (SOAV) sales. In a log-scale sale, the volume of wood removed from the tract is measured (scaled) by the seller or a third party and the purchaser

agrees to pay a specific amount for each unit of merchantable volume he or she removes. Log-scale sales are often called scaled sales or pay-as-cut sales.

Several studies have examined the relative advantages and disadvantages of these two payment methods, yet there is still significant uncertainty surrounding the preferred method. Maroaka and Watson (1983, 1986) advocated for the use of lump-sum sales for USDA-FS sales, reporting that they are less costly to administer (i.e., monitor), generate higher bids, and help encourage timely harvests. However, a potential drawback associated with the lump-sum method is that risk is shifted almost completely to the buyer and away from government. Recent empirical work by Haley (2009) suggests the log-scale method is susceptible to bid skewing and revenue loss for the seller. Transaction-cost models suggest that log-scale sales are preferred when pre-sale volume measurement costs are high and when monitoring of harvest activities (e.g., tracking truck-loads of timber) is relatively cheap (Leffler and Rucker 1991). In contrast, risk-based models suggest that, given risk aversion, lump sum is the sellers' preferred method of payment when there is a high degree of tract heterogeneity (Leland 1978; Mead et al. 1985).

The only previous qualitative effort to describe attitudes regarding the differences between lump-sum and log-scale methods conducted interviews and questionnaires with US Forest Service personnel and stumpage purchasers (USDA-FS 1997). Results from this study reinforced the ambiguity surrounding the preferred method of payment that pervades the rest of the literature. For example, one of the common comments from USDA-FS personnel was that program administrators should be allowed to "use the right tool for the job" (p. 5).

To develop a greater understanding of the prevailing attitudes regarding timber sale payment methods, we asked state timber sale program supervisors to describe the methods of payment used by their programs and their perceptions about relative effectiveness. Overall, there was very little supervisor agreement on whether lump-sum or log-scale is the preferred timber sale payment method. The payment method varied greatly between states (Table 1). Most states use either all lump-sum sales, or a mix of log-scale and lump-sum sales. Supervisors did not express a strong interest in radically changing their state's payment method.

Many supervisors, primarily from states that utilize lump-sum sales exclusively, believed lump-sum sales have lower administrative costs because programs do not have to spend resources tracking each load of wood once it leaves the harvest site, obtaining scale tickets from loggers and/or the mills processing the timber, and handling the scale tickets to bill purchasers for the timber they harvested. One supervisor summarized many of these thoughts in one succinct comment.

"More of the same on the difference between the lump-sum and the pay-as-cut (i.e., I agree with what others have said). With the lump-sum there are less administrative problems and you get a better price."

In some instances, supervisors felt lump-sum sales generated greater revenue.

"One of the main reasons we do lump-sum is that we feel like we wind up with higher prices. We get a little bit more competitive bid... Where we may look at it

and think it's one thing, when they run it through the mill it gets merchandised differently... The biggest reason [we utilize lump-sum sales] is probably to alleviate that confusion. We feel like we get higher prices overall through lump-sum."

Many of the states using the lump-sum method for selling stumpage have a very thorough timber cruising process and indicated most of the purchasers conduct their own timber cruises before bidding on a tract, thereby reducing the likelihood of a dispute over the estimated volume of timber on a sale. At least one state requires bidders to visit the tracts before they are allowed to submit bids. Another reason states may chose to utilize lump-sum sales is the absence of a third-party entity, such as a scalers' bureau or an acceptable independent consuming mill, to resolve disputes that may arise during the scaling process.

Some timber sale supervisors using the log-scale payment method preferred their current system of scaling to an all lump-sum method of payment. For these individuals, chain-of-custody certification was cited as the dominant reason for this preference. In the case of chain-of-custody certification, states are required to track and obtain scaling tickets for all truck loads of state timber leaving the harvest site, so the additional administrative time needed to utilize the log-scale payment method to bill stumpage purchasers is relatively modest.

"We're chain of custody certified through [Forest Stewardship Council] and that requires that we track every load so we're getting the mill slips in any case because that's part of our tracking system... So the additional time for the scaling system is doing the ticket reconciliation in the office and I think we save much more in field work and sale prep than we spend in that office work reconciling tickets. So I think we're way ahead with scaling."

Another reason some timber sale supervisors preferred the log-scale payment method is it may reduce the number of disputes with loggers over the accuracy of cruise estimates made by state foresters. State timber sale supervisors also indicated stumpage purchasers in their state typically prefer log-scale sales because they did not have to take on as much risk when bidding on a tract offered for sale.

3.4.1.2. Auction method (oral vs. sealed bid)

Results from Section 2.3.4.1 of this study indicate state timber sale programs utilize two different methods of auctioning state stumpage, ascending-price (i.e., oral auctions) and first-price sealed bid (i.e., sealed bid auctions). Yet responses provided by state timber sale program supervisors on the questionnaires provided very little insight into the relative advantages and disadvantages of each auction method. Standard auction theory suggests that, given a set of assumptions, an auction will have the same winning price no matter the type of auction (Riley and Samuelson 1981). However, from a practical perspective, auction method can have a significant effect on the final outcome, including the winning purchaser and the final selling price (Klemperer 2002).

Previous research suggests differences between oral and sealed bid timber sale auctions often depend on local or auction-specific characteristics. For example, Hansen (1986) found that sealed bids generate higher prices. However, Weiner (1979) and Haynes (1980) found that sealed

bids only generate higher stumpage prices in areas of lower competition. Johnson (1979) found a similar result: sealed bids sell for more at sales where there are fewer competing bidders. Brannman (1991) suggests oral auctions can result in preclusive bidding, or extremely high bidding by local firms who want to maintain market share. Under such a bidding environment, local firms place extremely high stumpage bids at a small number of auctions in an attempt to deter outsider firms from entering the bidding process at future auctions even if they value the timber more highly (Brannman 1991). Subsequently, stumpage prices are kept low as a result of reduced competition. Sealed bidding does not allow preclusive bidding, resulting in higher prices because outside competition is not discouraged from bidding. We found no previous studies that used qualitative methodology to obtain perceptions and opinions regarding oral and sealed bid auctions.

In our focus groups, we asked state timber sale program supervisors to discuss their attitudes towards the two different auction methods. The supervisors participating in our focus groups strongly preferred sealed bid auctions over oral auctions as the method of selling state timber. Most states represented in the focus groups utilize a sealed bid auction method (Table 1). Of the states that use sealed bid auctions, no supervisor expressed an interest in switching to an oral auction method. Additionally, some states using oral auctions expressed interest in increasing the proportion of sealed bid auctions used by their state agency.

Participants preferred sealed bid auctions for a variety of reasons. They believed sealed bid auctions generate more revenue than oral auctions. These supervisors also expressed concerns over the potential for exorbitant, irrational bidding that can be associated with oral auctions. The following quotes are typical of many supervisor comments.

“I’ve had no experience with an oral [auction]. My fear would be that on the sealed bids we deal with, a lot of times we have quite a large spread between prices. My fear would be that if it were an oral auction that some of that spread would be compressed down and occasionally we get some with some pretty high bids that we’d lose those over the top bids if we did it just through an oral auction.”

“I do feel pretty strongly that sealed bidding gives you that fair market value. If someone has a better market than the next person, they bid what they can. You get away from the exorbitant bidding, kind of the oral auction mentality. It’s hard to debate [that sealed bids do not generate] the fair market value, even though [purchasers] leave some money on the table. I hate to see that, but I feel pretty confident that we’re getting the fair market value.”

A couple of supervisors indicated that stumpage purchasers in their state dislike the sealed bid process because they “leave money on the table” when the winning bid is significantly higher than the second highest bid. However, the states that currently use sealed bid auctions do not consider this to be a problem. The following comment from one supervisor effectively summarized many supervisors’ sentiment to concerns about stumpage purchasers being forced to leave money on the table.

“That’s just the way everybody does it around here. Nobody complains about it.”

3.4.2. Program Issues, Problems, and Barriers to Effective Administration

In addition to obtaining perspectives on key program attributes, we were interested in obtaining supervisors’ thoughts and opinions on the problems and barriers their program is facing. Comments from supervisors often fell into one of four major thematic categories: (1) encouraging best management practices and desirable operator performance; (2) reducing administrative costs through technological upgrades; (3) the position of the timber sale program within state government; and (4) program responsiveness.

3.4.2.1. *Encouraging best management practices and desirable operator performance*

Many supervisors expressed concern about, or interest in, finding more effective ways to encourage desirable operator (i.e., logger) performance. Currently, most of the states participating in the focus groups have a process whereby tracts of timber are awarded to the highest bidder and the state agency utilizes a set of regulations and penalties to encourage desirable operator performance and well-timed silvicultural activities. However, supervisors wanted more effective tools to give preference to operators who are more likely to follow best management practices and who have a history of excellent performance.

The primary tools used by timber sale programs to encourage responsible operator performance were logger training and education programs, logger certification programs, and financial penalties for contract noncompliance. While some supervisors were content with their current system, others were concerned about their program’s inability to effectively and objectively design a sale process that gave preference to operators that have a history of high quality performance. One supervisor described his/her state’s system for encouraging desirable operator performance this way.

“We’ve got the [performance] bond thing going. It’s more of a [system where] if you don’t do what we’re hoping to have done, then there are some penalties there. We’ve talked about ways of trying to reward loggers that don’t require [state] supervision and are constantly doing exactly what we want, but we haven’t worked out the details where we could make it objective enough, at this point. We’re still struggling with the subjectivity. There could be claims of prejudice...”

The following comment from another supervisor is representative of those we heard about a potential method to reward good operators.

“I would love a merit system or some kind of reward system, but I just don’t think the state government would allow that here. With the state rules, it would kind of be like a Halliburton deal if people started rewarding loggers. I’d love it. I think it’s a great idea.”

Timber sales are frequently used as a tool to achieve silvicultural objectives (e.g., vegetative management, wildlife habitat enhancement), many of which depend on management activities occurring within a specific time frame (e.g., immediately harvest a stand of timber infected by disease or an insect infestation, harvest a stand before it becomes too decadent for successful

natural regeneration to occur). Despite this need for timely management activities, many program supervisors indicated they were finding it difficult to encourage stumpage purchasers to harvest a timber sale in a timely manner due to depressed market conditions that existed at the time the focus groups were conducted. During the period of tremendous stumpage price increases that existed in the earlier part of this decade, multi-year timber sale contracts allowed purchasers to base their stumpage bids on expectations about future prices. Expecting prices to continue to rise, purchasers thought they could place very high stumpage bids and still harvest the timber in a few years at below-market prices. Once stumpage prices began to decrease and markets for wood dried up, states had difficulty encouraging purchasers to harvest the high priced sales and collecting the timber sale revenue. When we asked supervisors about the greatest improvements that could be made to their program, one supervisor made the following observation.

“I would look for ways to discourage speculation. We benefited greatly from speculators in the past and received a premium price for our timber, but it has really caused problems in the last couple years.”

Another supervisor added:

“We currently are in a situation where a number of bidders had speculated on the price continuing to rise. Rather than have them default on the sales, we’ve extend the sales. We’re into about a year and half on extensions now and it’s causing us some problems revenue wise... We’re having difficulties with the current market downturn... In many cases, [stumpage purchasers] are not just unwilling, but they’re unable to actually cut the timber at [high] past prices. Our policy has been, at least up until now, to extend the sales in hopes that the market would return. Because of the continued decline and the length of period the market has been down, I’m not sure that’s going to be an entirely effective practice and we’re looking at other ways perhaps of dealing with the potential for a large number of our contractors to eventually default on their contracts.”

Supervisors proposed potential strategies that could be used to discourage speculative bidding on state timber sales and encourage timely management activities. The most highly regarded strategy with many of the supervisors was the use of interest payments, whereby stumpage purchasers would be charged an annual interest rate (billed monthly or quarterly) between the time they purchase the sale and the time the sale is harvested. Several supervisors commented on their interest in using interest rates as a tool to encourage desired behavior.

“One [change] we’ve talked about a little bit, I like the idea of price indexing where it becomes an advantage to a logger to cut the sale in the first or second year, more of a financial penalty for holding it 3-5 years.”

“I’m interested in [charging interest as a way to discourage speculative bidding]. We’re talking about doing something like that and that’s something we need to do more often probably.”

“The way [State X] is doing it with the [charging interest] on the lump sum bid sounds interesting... We probably went in the other direction to allow speculation in the past. I think we need to bring that back and perhaps discourage that, at least on some of our sales.”

“I think having working for the Forest Service and seeing what others do, I think the interest charges really encourage the purchasers to log the sale and not sit on it; most cases we’re trying to get a silvicultural activity completed and it really does encourage [loggers] to do that.”

3.4.2.2. Reducing administrative costs through technological upgrades

Another common theme that emerged during the focus groups was the difficulty keeping the cost of administering state timber sales as low as possible. Many supervisors were interested in reducing the costs associated with setting-up (e.g., cruising timber, writing contracts) and administering (e.g., supervising harvest operations, accounting and billing) timber sales, but identified several barriers prohibiting them from doing so. The most commonly-cited barrier to reducing administrative costs was inadequate technology and computer software systems. One supervisor made the following illustrative comment:

“We need to embrace the technology a lot better than we currently are.”

States saw an opportunity to reduce administrative costs by improving the technology used by field foresters and administrative staff. Consider the following observation provided by one focus group participant.

“One of the things that we’ve got to do is cut down our operating costs. We don’t have a database that’s spatially attached in there. We really need to get a database better established. Also, get our sale process automated so the foresters only have to input the data once, then the contract and other required documents are an output of that. We’re working on that, but it’s going to be awhile to get there. We’re thinking that could save us a lot of time, such as office time for our foresters, but also a lot of planning time by having both of those in place.”

In general, states with larger timber sale programs expressed greater concern over inadequate technology than their counterparts in states with smaller timber sale programs. The focus group that contained only supervisors of large timber sale programs had considerable discussion about potential improvements in technology related to administering state timber sales. Inadequate technology was identified as a program barrier in the other focus groups, but not to the degree that we saw in the group comprised of states with large timber sale programs. The following comment is very representative of comments we heard about technological improvements, especially by larger timber sale programs.

“We’re looking at technology to leverage costs downward and efficiency upward. The big thing for us is that we’re cash strapped right now... We have a system that generates our contracts, advertising, or notice of sale, whatever you want to call it. We have inventory databases. We have all kinds of things that are out

there, but they don't talk to each other. We're aiming towards what [other supervisors] were just talking about, which is a common entry point for common data. That's being elusive for us at the moment."

In some instances, states gave examples of how previous technological advances helped reduce administrative costs. Websites that advertise timber sales have helped reduce advertising costs. Additionally, one state indicated the use of Microsoft SharePoint technology helps reduce timber sale administration costs by streamlining the collection and management of data collected on the state's various timber sale forms.

"What [our state does] is leverage Microsoft's SharePoint software. We have regional offices scattered across the state. Each one was storing their own timber sale data on their forester's computer or region office computer, and then they were transferring it to us here in [the state capitol]. What SharePoint does is it gives a common site and it's internet operated, so our foresters are loading their documents onto this system and it's the same thing they're looking at in the regional office that ends up on my desk here in [the state capitol]. It's an incredibly powerful tool for collating and storing documents."

Many other states are looking for opportunities to reduce administrative costs through similar technological improvements.

"So we have a whole project going on right now that's looking at all of our systems and integrate them and make them one point of entry. Right now we've got multiple databases with information on it. If you want to get info on a harvest or what we've sold, you've got to go to different places. So we've got an official program going on right now to revise the system so we have better accountability and billing capabilities."

3.4.2.3. Position of timber sale program within the state government

State timber sale program supervisors frequently expressed concern over their programs' position within the state government, particularly as it relates to the allocation of revenue generated from the sale of state timber, forest management accounts, and priorities relative to other forest related programs. For example, several supervisors indicated a strong preference for "protected" timber sale receipt accounts. In many states, a portion of timber sale revenue goes into an account (e.g., forest management account) that is used to pay for program operations. In some states, the legislature has reallocated timber sale revenue from these dedicated forest management accounts to other state agencies and programs. Several supervisors indicated that unprotected management accounts have adversely affected their agency's budgeting and silvicultural strategies.

"Each year the money we don't spend goes into [an account in the state capitol]. Although it's in an account in our name, it technically becomes money of the state. The money is not necessarily protected. I think people [in the capitol] understand what the money's for, but it's fair game, particularly in times like

these. That prevents us from selling timber when prices are high... you don't want to get the number in the account too big because it becomes very noticeable.”

Also, some programs are facing an increased financial burden due to the fact that the revenue from timber sales is used to support other state forest-based programs, such as recreation and wildlife. Multiple supervisors indicated that they are seeing greater emphasis on recreation and wildlife management programs within their state, but without a change in the funding system.

“We also support recreation and wildlife projects [with timber sale revenue]... which used to be fine for the first 80 years when very few people came out to the state forest system for recreation, but probably in the last 20 years the demands for recreation have increased, basically under the same funding system. That creates a bit of a burden. It would be nice if funds were available for other programs.”

Together, uncertainty surrounding long-term retention of timber sale revenues deposited in forest management accounts and the financial burden being placed on timber sale programs due to changing priorities within the state make effective timber sale program administration increasingly difficult.

3.4.2.4. Program responsiveness to unique and changing conditions

Another theme that emerged during the focus groups is the concern of state timber sale program supervisors about their program's inability to respond to unique and changing timber market conditions. Specifically, they want greater latitude to tailor their sale method to the unique conditions associated with each tract and enhanced capabilities for dealing with depressed market conditions.

Timber sale programs often have strict rules that govern how a particular tract offered for sale is set-up and administered, with very little discretion given to local foresters. Supervisors pointed to numerous examples of mandatory procedures or policies that created a barrier to effective program administration. One example is when states are required to auction all tracts of timber. While auctions are often a useful tool for generating a fair market value for timber, focus group participants indicated there may be instances when mandatory auctions create a barrier to conducting emergency forest management in response to natural disturbances (e.g., wildfire, insect or disease infestation). When such conditions exist, the auction process may take too long to allow for timely management to occur. One solution is to allow the state to negotiate stumpage prices directly with an operator to accomplish the management needed in the stand as quickly as possible. In other circumstances, mandatory auctions may result in reduced financial returns over what could have been otherwise generated from the stumpage sale. For tracts that typically have a low level of competition (e.g., one or two bidders per sale), states may be able to negotiate directly with a buyer a sale price that is close to the timber's fair market value.

Supervisors also expressed concern about their program's response to the economic recession that prevailed at the time of the focus groups. Programs were in the difficult position of balancing short-term financial return with the need to maintain the long-term viability of the regional wood products industry. Subsequently, there was a significant degree of uncertainty

regarding the best method for dealing with depressed economic conditions. This sentiment was expressed by the following focus group participant.

“An issue that I don’t think was mentioned here, and I think everyone is probably seeing this, is the overall health and viability of the industry. That’s something that we worry about. We worry about the forest industry going away and we’re not going to be able to get good silviculture done on public lands... [However,] I hate to sell timber in a bad market and not get a high price.”

3.5. Summary and Conclusions

We used focus group methodology to obtain perceptions from state timber sale program supervisors from across the country regarding key timber sale program attributes, the problems and barriers facing their programs, and potential areas for improvements. Each state timber sale program is unique, developing its policies and procedures within the historical, physical, economic, and political conditions unique to that state. This diversity makes it difficult to offer recommendations for improving program efficiency and effectiveness that apply to all state timber sale programs.

Yet, several key themes were identified during our discussion with state timber sale program supervisors that could be used as guiding principles for states that are looking for opportunities to improve timber sale program operation and administration. These themes include the following:

First-price sealed bid auctions. Most states prefer first-price sealed bid auctions to ascending price (oral) auctions. Sealed bid auctions have the potential to generate greater revenue to the state. They also tend to reduce exorbitant bidding behavior that can exist in an oral auction bidding environment. The state timber sale supervisors who participated in our focus groups believe a sealed bid auction will generally generate fair market value for stumpage.

Procedures to reward good loggers. States rely heavily on the performance of loggers to carry out the vegetative management actions needed to manage their forest resource. High quality loggers play an important role in states’ ability to meet their forest management goals. Programs could benefit from the adoption of procedures that reward operators who display a commitment to following best management practices and meeting contract obligations, possibly in the form of bidding preference on future state timber sales. An important challenge in doing so is developing specific metrics by which to objectively measure logger performance.

Incentives to encourage timely harvests. States are better able to meet their forest management goals when loggers harvest wood in a timely manner. Timber sale contract provisions should provide loggers adequate flexibility to manage their portfolio of timber sales, yet encourage them to harvest the timber within the specified time frame that will achieve the silvicultural objectives for the stand. Such provisions would also potentially enhance gross timber sale receipts. Charging the holders of state timber sale permits interest on the value of uncut timber is one potential means by which this could be achieved.

Improvements in technology. Opportunities exist to enhance administrative efficiencies through upgrades in technology and computer software, particularly in states with large timber sale programs. States often have outdated technology or multiple databases that are not effectively integrated. Improvements and upgrades in this technology have the potential to reduce program administrative costs significantly.

Protected forest management accounts. In several states, the receipts generated from state timber sales are dedicated for internal timber sale program operations. Reallocation of state timber sale revenue to nonforestry programs creates a disincentive to manage the portfolio of state lands in a manner that maximizes the program's return on its investment. State timber sale programs should be administered with full knowledge and certainty regarding the allocation and use of timber sale revenue.

Greater flexibility to adjust sale methods to specific conditions. In some instances, mandatory timber sale procedures prevent foresters from achieving program goals. For example, greater flexibility to negotiate sale prices in areas where there is low competition for state timber and situations when emergency stand management is necessary may increase gross revenue and improve forest health. Providing foresters and timber sale staff with greater discretion may help programs generate greater revenue and achieve forest management goals more effectively.

Barriers to effective administration often fell into one of four categories: (1) encouraging best practices and desirable operator performance; (2) reducing administrative costs through technological upgrades; (3) the position of the timber sale program within state government; and (4) program responsiveness to unique and changing market conditions. States should keep these problems and barriers in mind as they look for ways to improve state timber sale program design and administration.

4. Hedonic Analysis of MN DNR Timber Prices

Any potential policy changes intended to improve state timber sale processes need to be informed by a greater understanding of factors influencing willingness to pay for stumpage sold on state-administered forest land. To address this need, we conducted a hedonic price analysis to assess how state timber sale policies and administrative procedures impact the price paid for a tract of timber. The results from this analysis can then be used to assess how potential changes in the design and administration of MN DNR's timber sale program would impact its ability to achieve forest management goals.

4.1. Background

The hedonic model has been and continues to be the dominant theoretical and methodological framework to analyze timber sale data and describe how individual characteristics influence the price of stumpage on public land. Rosen (1974), Griliches (1971), and Freeman (1974) are widely credited for the development of the hedonic framework. A hedonic price function is defined as a functional relationship between the price of a good, input, or service and the characteristics embodied in that good, input, or service.

A review of existing stumpage price research reveals a plethora of characteristics that potentially influence willingness to pay for public stumpage, including physical characteristics (e.g., species-product composition, harvest density) (e.g., Jackson 1987; MacKay and Baughman 1996), tract location (e.g., Buongiorno and Young 1984; Huang and Buongiorno 1986; Carter and Newman 1998; Niquidet and van Kooten 2006), product markets (e.g., Huang and Buongiorno 1986; Jackson 1987; Puttock et al. 1990; Sendak 1991, 1992; Carter and Newman 1998), and administrative procedures (e.g., harvest restrictions, bidder restrictions, contract length, reserve prices) (e.g., Johnson 1979; Weiner 1979; Munn and Rucker 1995; Carter and Newman 1998; Dunn and Dubois 2000; Kilgore and Blinn 2003; Leefers and Potter-Witter 2006).

Our review of the existing literature found several gaps in the available information describing factors that influence willingness to pay for stumpage in Minnesota. Notably, we found only one published study, conducted by MacKay and Baughman (1996), which assessed the influence of various sale characteristics on MN DNR stumpage prices. Since then, there have been significant changes in market characteristics and an updated analysis of recent data is necessary. We also wanted to assess the impact specific timber sale characteristics (e.g., total appraised volume, sale type (intermediate vs. regular)) have on stumpage prices; something MacKay and Baughman (1996) did not explicitly address in their analysis.

4.2. Data and Methods

To analyze the impact various timber sale characteristics have on public stumpage prices, we obtained data from an electronic database used to track 1993 to 2006 MN DNR timber sale activity. The database contained 13,173 records from all MN DNR timber sales conducted from 1993 to 2006, including information about the total appraised volume, species-product composition, sale acres, date of sale, date of sale expiration, type of sale (regular vs. intermediate), purchasing firm, location of tract, and price paid for the timber. Since the primary concerns associated with recent MN DNR timber price fluctuations focused on northern Minnesota stumpage markets, only tracts located in northern Minnesota were used in the analysis²⁷. Many 1993 to 2000 timber sale records were missing relevant information about the sale (e.g., species-product composition, selling price); consequently only 2001 to 2006 timber sale data were retained for further analysis. Noncompetitive timber tracts (i.e., informal sales) and salvage sales (e.g., tracts damaged by fire, disease, or infestation) were also removed, leaving 4,395 MN DNR timber sales for the analysis.

A hedonic price model was developed to describe how individual timber sale characteristics influence willingness to pay for that sale. While hedonic models are a common method of analysis, there is little guidance from economic theory concerning which particular functional forms are appropriate for empirical work (Puttock et al. 1990). Thus, several methods have been

²⁷ Timber sales in the following MN DNR administrative areas were included in our analysis: Aitkin, Backus, Baudette, Bemidji, Blackduck, Cloquet, Deer River, Detroit Lakes, Effie, Hibbing, Little Falls, Little Fork, Orr, Park Rapids, Sandstone, Tower, Two Harbors, and Wannaska. All of these areas are located in the MN DNR's Northwest or Northeast Regions, with the exception of Sandstone and Little Falls. Sandstone and Little Falls areas were included because they are located in close proximity to the Northwest and Northeast regions and the tracts offered for sale in these areas frequently contain similar characteristics to northern Minnesota tracts (e.g., a significant portion of aspen pulpwood).

used to estimate the marginal effect timber sale characteristics have on the price paid for timber. Previous hedonic models that quantify factors influencing stumpage prices used ordinary least squares (OLS) (Jackson and McQuillan 1979; Buongiorno and Young 1984; Puttock et al. 1990; MacKay and Baughman 1996; Dunn and Dubois 2000; Dahal and Mehmood 2005; Leefers and Potter-Witter 2006), Tobit models (Carter and Newman 1998; Sendak 1991), and truncated regression models (Niquidet and van Kooten 2006).

We utilized ordinary least squares (OLS) regression techniques to model MN DNR timber sale data. Given that certain conditions are met (i.e., random sampling, no correlation between the error term and explanatory variables), OLS techniques generate results that are relatively easy to interpret compared to other, more complex models. The data collected from the MN DNR contained only tracts that received a bid greater than or equal to the reserve price established for the timber, making one necessary condition for unbiased multiple linear regression parameter estimates—random sampling—questionable. If a significant portion of the total number of MN DNR tracts offered for sale did not receive a bid our data would not be random, rendering our OLS coefficient estimates biased and inconsistent. We analyzed paper copies of MN DNR records containing information on tracts offered for sale from 2004 to 2006. This analysis revealed that less than 5% of MN DNR tracts offered for sale did not receive a bid. Therefore, since such a small portion of the tracts offered for sale were excluded from our analysis, we assumed the data to be approximately random and proceeded with an OLS regression model.

We used SAS 9.2 software to estimate the following hedonic price function for northern Minnesota DNR timber sales²⁸:

$$\ln(\$/\text{cordE}) = \beta_0 + \sum \beta_j X_j + u$$

where X_j is the j th tract characteristic that may influence willingness to pay for public stumpage, β_j is the marginal impact of the parameter to be estimated, and u is an error term. Prices were defined as the average dollar per cord equivalent ($\$/\text{cordE}$) for all appraised species and products on the tract.²⁹ Table 5 describes the timber tract characteristics (X_j) included in the hedonic price function. A review of existing literature was used to develop a priori hypotheses about the impact each individual tract characteristic had on the price paid for MN DNR stumpage.

We converted timber sale prices into real terms (year 2000 equivalent) using the GDP deflator. We transformed stumpage prices using the natural log function to help normalize the dependent variable and reduce the influence of outlying observations (i.e., tracts that sold for extremely high prices). The natural log scale also enabled us to interpret coefficient estimates (β_j) as semi-elasticities. In other words, coefficient estimates were interpreted as follows: a one unit change in X_j produced a $(\beta_j * 100)\%$ change in the price paid for timber.³⁰ Also, the variables

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²⁹ Conversion factor used to convert to cord equivalents: 500 MBF sawtimber or veneer = 1 cord equivalent.

³⁰ This is an approximate estimate of the true impact on price. A more precise estimate is as follows: a one unit change in X_j produces a $100 * [(e^{\beta_j} - 1)]$ percent change in the price paid for timber (Wooldridge 2006, p. 198). The same correction can be made for binary (dummy) variables in the model (Halverson and Palmquist 1980). While the interpretation identified in the body of the text is approximate, it is used throughout the chapter to make reader interpretation easier.

PERCENTASPENPULP, VOLUME(<500), YEAR01, QUARTER4, WINTERONLY, and ORR were omitted from the model. These variables serve as reference points by which to interpret other coefficients within the same category. For example, the coefficient for QUARTER1 is used to estimate a ($\beta_j \cdot 100$)% difference in price compared to similar tracts offered for sale in QUARTER4.

Table 5. Description of timber tract characteristics included in the hedonic price function.

Timber tract characteristic	Description	Expected impact on prices
PERCENT[Species-Product]	The percent (0 to 100) of the total appraised volume in a given species-product category.	+/-
YEAR[2001-2006]	A set of six binary variables used to indicate the calendar year in which the sale occurred.	+/-
CORDSPERACRE	The total volume (cord equivalent) per acre.	+
VOLUME[<500,...,>=2000]	A set of five binary variables used to indicate the total appraised volume (cord equivalent).	+/-
CONTRACTLENGTHYEARS	The number of years between the date of the timber sale and the date the sale expires.	+
QUARTER[1-4]	Four binary variables that indicate whether the date of sale occurred during a given time of year; Quarter1=January-March; Quarter2=April-June; Quarter3=July-September; Quarter4=October-December.	+/-
DRY GROUND ACCESS	Binary variables that indicate whether purchasers may harvest in non-frozen ground conditions; SummerFallChance=Harvest possible June-November; WinterOnly=Harvest only on frozen ground; UnknownRestrictions=restrictions not identified in sale contract.	+
REGULARSALE	Binary variable that equals one if the sale was sold at a regular auction; equals zero if the sale was sold at an intermediate auction.	+
Location: {BEMIDJI, BLACKDUCK,, WANNASKA}	Group of binary variables describing the location of the sale by MN DNR administrative area.	+/-

A visual inspection of the plot of residual and predicted values did not reveal any trends in the error term (u), suggesting the model had acceptable function form. A Breusch-Pagan test for heteroskedasticity (Breusch and Pagan 1979) revealed significant nonconstant variance. Therefore, White's heteroskedasticity-consistent standard errors were used for all hypothesis tests (White 1980).

4.3. Results

The model explains approximately 63% of the variation in the natural log of stumpage prices (Table 6). An analysis of independent variables revealed no major multicollinearity problems. The following section discusses the impact each tract characteristic had on the price paid for

stumpage. For each tract characteristic, a brief summary of results from previous stumpage price research is provided, followed by a discussion of results from our analysis of 2001-2006 northern MN DNR tracts offered for sale.

Table 6. Results from OLS hedonic regression (dependent variable = $\ln(\$/\text{cord})$; $n=4,395$).

Independent Variables	Coefficient [†]	S.E. ^μ	Independent Variables	Coefficient [†]	S.E. ^μ
Constant	2.4091***	0.0573	VOLUME(500-999)	0.1511***	0.0163
PERCENTASPENBOLTS	0.0049***	0.0010	VOLUME(1000-1499)	0.1745***	0.0249
PERCENTHARDPULP	-0.0107***	0.0005	VOLUME(1500-1999)	0.1693***	0.0417
PERCENTHARDBOLTSSAW	0.0074***	0.0022	VOLUME(≥ 2000)	0.2687***	0.0515
PERCENTCEDARTAMARACK	-0.0165***	0.0004	CORDSPERACRE	0.0158***	0.0010
PERCENTBALSAMFIR	-0.0044***	0.0007	CONTRACTLENGTHYEARS	0.0395***	0.0081
PERCENTSPRUCE	-0.0020***	0.0004	YEAR02	-0.1572***	0.0178
PERCENTPINEPULP	-0.0039***	0.0004	YEAR03	-0.0881***	0.0188
PERCENTPINEBOLTSSAW	0.0106***	0.0006	YEAR04	0.0207	0.0198
PERCENTHARDFUEL	-0.0132***	0.0011	YEAR05	0.3812***	0.0217
PERCENTOTHER	-0.0118***	0.0043	YEAR06	0.0149	0.0199
AITKIN	0.2861***	0.0330	QUARTER1	0.0647**	0.0259
BACKUS	0.3460***	0.0350	QUARTER2	0.1720***	0.0134
BAUDETTE	0.1732***	0.0332	QUARTER3	0.0772***	0.0264
BEMIDJI	0.3076***	0.0362	SUMMERFALLCHANCE	0.0669***	0.0163
BLACKDUCK	0.3545***	0.0361	UNKNOWNRESTRICTIONS	0.0245	0.0157
CLOQUET	0.1823***	0.0428	REGULARSALE	-0.0170	0.0632
DEERRIVER	0.3404***	0.0414	REGULAR*VOLUME(500-999)	0.0057	0.0342
DETROITLAKES	0.3564***	0.0534	REGULAR*VOLUME(1000-1499)	0.0394	0.0408
EFFIE	0.2240***	0.0387	REGULAR*VOLUME(1500-1999)	0.0518	0.0556
HIBBING	0.2425***	0.0344	REGULAR*VOLUME(≥ 2000)	-0.0191	0.0618
LITTLEFALLS	0.3158***	0.0520	REGULAR*CORDSPERACRE	-0.0002	0.0014
LITTLEFORK	0.2176***	0.0353	REGULAR*CONTRACTLENGTH	0.0055	0.0115
PARKRAPIDS	0.3870***	0.0358			
SANDSTONE	0.4280***	0.0439	<u>Model Fit</u>		
TOWER	0.2205***	0.0366	R-square = 0.6290		
TWOHARBORS	0.2267***	0.0476	Adj. R-square = 0.6247		
WANNASKA	0.1300***	0.0348	F-stat. = 129.35 (pr < 0.0001)		

† ***= significant @ 1% level; **= significant @ 5% level; *=significant @ 10% level.

μ White's heteroskedasticity-consistent standard errors.

4.3.1. Species-Product Composition ($PERCENT\{Species-Product\}$)

The species-product composition of a tract offered for sale has a significant impact on stumpage prices because it reflects the quality of the wood as an input in production of secondary wood products (Table 6). In our analysis of MN DNR stumpage prices, the direction of all species-product coefficients is consistent with what we expected. Recall, the baseline (omitted) variable

in our model was PERCENTASPENPULP. A greater percentage of species that typically sell for lower prices than aspen pulpwood, such as other hardwood pulpwood, balsam fir, spruce, and pine pulpwood, decreased the stumpage price of a tract. On the other hand, a greater proportion of more valuable species-product categories, such as bolts and sawtimber, increased the price paid for the tract of timber.

4.3.2. Location (*AITKIN, BACKUS, ..., WANNASKA*)

Previous studies suggest that stumpage price differences between locations may be caused by three different factors: topography, hauling costs, and competition. The slope and soils of one location may not accommodate common harvest equipment (e.g., feller-bunchers, skidders) as well as another. This difference can result in higher harvest costs and reduced stumpage prices (Dahal and Mehmood 2005). Another reason for stumpage price differences is the hauling distance to processing facilities. Previous studies indicate that higher hauling costs significantly reduce stumpage prices (Buongiorno and Young 198; Huang and Buongiorno 1986; Jackson 1987; Puttock et al. 1990; MacKay and Baughman 1996; Carter and Newman 1998; Niquidet and van Kooten 2006). In other studies, hauling costs were found to have no influence on stumpage prices (Nautiyal et al. 1995; Dunn and Dubois 2000). A final factor associated with the location of a tract that may influence stumpage prices is the level of competition. The number of loggers and primary processing facilities within a certain distance of the site has a direct influence on the demand for stumpage and the competition for timber tracts. Many previous stumpage price models found that tracts offered for sale in locations with high levels of competition command a significantly higher price than tracts where competition is low (MacKay and Baughman 1996; Carter and Newman 1998; Sendak and McEvoy 1989; Dahal and Mehmood 2005; Leefers and Potter-Witter 2006; Niquidet and van Kooten 2006). Each of these three factors can explain regional price differences and, in some cases, it may be a combination of the three.

The location of MN DNR timber tracts offered for sale had a substantial impact on stumpage prices (Table 6). Recall, the baseline (omitted) variable was tracts located in the Orr area. The choice of the omitted variable had no effect on model results—it simply provides a baseline from which the coefficient estimates may be interpreted. We chose to omit ORR from the model after we observed that the Orr area had the lowest stumpage prices. With ORR as the omitted variable, all other areas can be evaluated by the degree to which their stumpage prices are higher than prices in the Orr area. All of the coefficients on the location variables are positive and statistically different from zero, indicating timber tracts in all areas sold for significantly higher stumpage prices than similar tracts in the Orr area. Stumpage in Wannaska and Baudette areas sold for the next lowest prices, only 13.0 and 17.4% greater than similar sales in the Orr area, respectively. Stumpage in Sandstone and Park Rapids sold for the highest prices—at least 38% more than similar sales offered in Orr.

4.3.3. End-Product Market Conditions (*YEAR[2001-2006]*)

The market price for goods that use timber as an input in the production process will have a significant influence on purchasers' willingness to pay for stumpage. The price for wood products, such as OSB, lumber, and paper are typically set in the marketplace. An increase in a good's market price increases demand for inputs in the production process, thereby increasing stumpage prices.

We used annual dummy variables to control for changes in end-product market prices. Previous hedonic stumpage price studies used two primary methods to account for temporal changes in end-product markets: product price indices and annual dummy variables. Product price indices are preferred when researchers want to assess how changes to specific product markets influence stumpage prices (Huang and Buongiorno 1986; Jackson 1987; Puttock et al. 1990; Sendak 1991, 1992; Carter and Newman 1998; Huebschmann et al. 2004; Dahal and Mehmood 2005; Niquidet and van Kooten 2006). Unfortunately, Minnesota has a diverse wood-based product market (e.g., paper, OSB, lumber), making it difficult to establish a reliable product price index that accurately reflects end-product markets for the stumpage on a specific timber sale.³¹ In replace of product price indices, annual dummy variables can be used to account for the differences in product market conditions from one period to the next (Buongiorno and Young 1984; Dunn and Dubois 2000; Leefers and Potter-Witter 2006). Annual dummy variables do not quantify the relationship between individual end-product price indices and stumpage prices, but they can be used to control for broad product market conditions when the primary research objective is to look at the impact of sale-specific characteristics (e.g., contract length, sale size, sale type).

The YEAR[2002-2006] coefficients estimated in our model confirmed our expectations about the relationship between end-product market conditions and stumpage prices—strong end-product markets increased the price paid for stumpage (Table 6). For example, when most end-product prices were high, such as in 2005, willingness to pay for the inputs used to produce these products (i.e., stumpage from state land) increased. With a temporary dip in end-product prices, such as in 2002, willingness to pay for stumpage decreased. Figure 15 illustrates average real stumpage prices (\$/cordE) for all species and products from 2001-2006. Changes in average stumpage prices mirror results from our hedonic model—relatively stable prices, except for a large spike in 2005.

4.3.4. Season of Sale (*QUARTER[1-4]*)

The season of sale can have a significant effect on stumpage prices. Dahal and Mehmood (2005) found that stumpage prices were higher in the autumn in the southern US. Since autumn is typically the driest season, they speculate that purchasers are willing to pay more for stumpage because they are less likely to encounter immediate restrictions on harvest days due to wet weather. Also, Carter and Newman (1998) and Leefers and Potter-Witter (2006) found that different seasons have different levels of competition and can significantly influence stumpage prices.

Results from our hedonic model show season of sale had a significant impact on MN DNR stumpage prices (Table 6). The greatest amount of MN DNR stumpage was sold in Quarter 2 and Quarter 4. The statistically significant positive coefficients on all three seasonal variables indicate that tracts offered in the fourth quarter of the calendar year (October-December) had the lowest prices. For example, tracts offered in the second quarter (April-June) of the year sold for 17% higher prices than similar tracts offered in the fourth quarter.

³¹ We attempted to include a quarterly weighted-average product price index, developed by the state forest economist, in our model. However, the model explained a greater amount of variation when annual dummy variables were included.

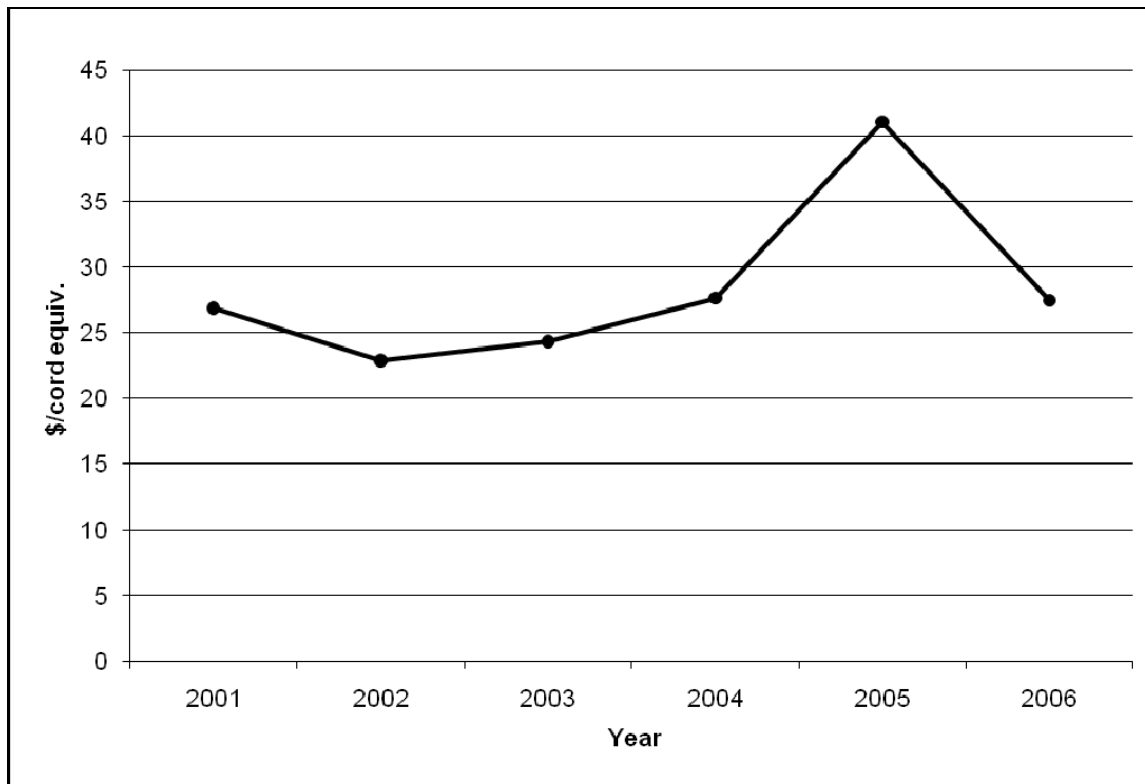


Figure 15. Average 2001 to 2006 northern MN DNR real stumpage prices for all species-products.

4.3.5. Harvest Density (*CORDSPERACRE*)

Greater harvest density, expressed as appraised volume per unit sale area, may allow operators to harvest more timber volume in a shorter amount of time with less tree-to-tree travel time for fellers and faster skidding operations. Previous studies reported that harvest density is a factor that increases stumpage prices (Jackson 1987; MacKay and Baughman 1996). However, other studies found that harvest density has no significant influence on stumpage prices (Buongiorno and Young 1984; Munn and Rucker 1995; Carter and Newman 1998; Leefer and Potter-Witter 2006).

The coefficient for *CORDSPERACRE* in our model indicates an increase in appraised volume per unit sale area (cord equivalents/acre) increased stumpage prices (Table 6). A one unit increase in harvest density (e.g., 20 to 21 corde/acre) increased MN DNR stumpage prices by 1.6%. Low harvest density tracts (e.g., a thinning) sold at a lower price.

4.3.6. Contract Length (*CONTRACTLENGTHYEARS*)

Previous stumpage price analyses have shown that longer contract lengths increase willingness to pay for stumpage (Munn and Rucker 1995; Dunn and Dubois 2000; Leefer and Potter-Witter 2006); yet there is still very little information about the underlying motivation driving these price premiums.

Results from our hedonic model indicate that, from 2001 to 2006, an additional year on a timber sale contract increased the price paid for a MN DNR timber tract by 4% (Table 6). This reinforced results from previous research—longer contracts generated higher stumpage prices. In

preliminary models, we also added interaction variables (e.g., YEAR02*CONTRACTLENGTH, YEAR03*CONTRACTLENGTH) to determine whether longer contracts had a greater impact on the price paid for stumpage in different years. None of the interaction variables were significant, suggesting that longer contracts increased the price paid for stumpage from 2001 to 2006, but the marginal impact of an extra contract year was constant throughout the entire period.

4.3.7. Seasonal Operating Restrictions (*SUMMERFALLCHANCE*)

Public agencies often restrict certain harvesting practices in an effort to protect the environmental integrity of the stand. For example, harvesting operations may be restricted to periods when the ground is frozen or dry to limit soil compaction and rutting. Previous studies have reported that such restrictions on the periods of operation can cause a significant reduction in stumpage price (MacKay and Baughman 1996). Other studies found that general environmental guidelines and best management practices (BMPs) also have a negative effect on stumpage prices (Dunn and Dubois 2000; Kilgore and Blinn 2003).

Results from the hedonic model indicate that allowing harvest operations on non-frozen ground conditions significantly increases MN DNR stumpage prices. The coefficient on SUMMERFALLCHANCE indicates that stumpage prices were nearly 7% higher when purchasers were given a chance to harvest the timber during the summer (June-August) or fall (October-November) (Table 6). Seasonal operating restrictions are a major tool used to minimize the environmental impacts of timber harvesting operations. Model results show that allowing harvesting on dry ground conditions generates higher stumpage prices and may help generate greater financial returns to the state.

4.3.8. Total Appraised Volume (*VOLUME*[<500,...,>=2000])

Previous research on the effect of sale size (e.g., total appraised volume, sale acres) on stumpage price is inconclusive. Depending on the study, larger sales were found to increase prices (Jackson 1987; Carter and Newman 1998; Niquidet and van Kooten 2006), decrease prices (Jackson and McQuillan 1979; Buongiorno and Young 1984; Puttock et al. 1990), or have no effect on stumpage prices (Johnson 1979; Huang and Buongiorno 1986; Munn and Rucker 1995; Leefers and Potter-Witter 2006). Larger sales may enhance the logger's ability to distribute fixed costs associated with relocating equipment to a new harvest site over a large harvest volume, which increases willingness to pay per unit volume harvested. Alternatively, an explanation for price decreases is that smaller bidders may not have the necessary capital to bid on large harvest sites, so an increase in size reduces the number of potential bidders (i.e., competition) and decreases stumpage prices.

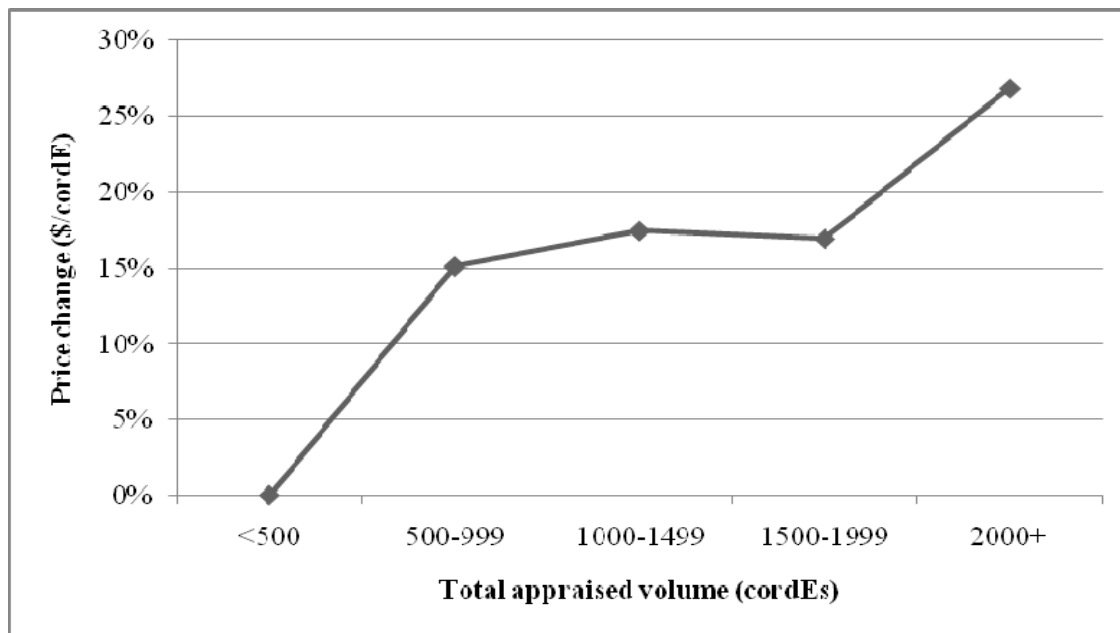
We used total appraised volume to measure sale size because, when compared to sale acres, it predicted a greater amount of stumpage price variability (i.e., higher model R-square). We separated MN DNR sales into five different appraised volume categories to identify: (1) the impact tract size had on the price paid for MN DNR stumpage; and (2) the tract size that elicited the highest stumpage prices. The five volume categories were chosen somewhat arbitrarily, but we were careful to ensure that a significant number of tracts offered for sale were in each category (Table 7).

Table 7. Number of 2001 to 2006 tracts offered for sale within each appraised volume category.

Appraised volume category	Number of tracts offered for sale	Percent of total tracts offered for sale
Less than 500 cordE [†]	1619	36.9%
500-999 cordE	1343	29.5%
1000-1499 cordE	688	15.7%
1500-1999 cordE	320	7.3%
≥2000 cordE	425	9.7%

[†]CordE = cord equivalents.

Results from our hedonic model suggest that tract size had a significant positive impact on MN DNR stumpage prices (Table 6). Tracts with less than 500 cordE of volume sold for the lowest prices. As total appraised volume increased, stumpage prices generally increased (Figure 16). There was not much difference in prices for tracts with 1000 to 1499 cordE and tracts with 1500 to 1999 cordE. Tracts with at least 2000 cordE of total appraised volume sold for the highest prices, 26.9% higher than tracts with less than 500 cordE.

**Figure 16.** Hedonic estimates of impact of total appraised volume on 2001 to 2006 timber prices.

4.3.9. Regular vs. Intermediate Sales (*REGULAR*)

The MN DNR sells nearly half of their stumpage at “intermediate” auctions, an administrative characteristic unique to the MN DNR timber sale program³². Intermediate auctions differ from regular auctions in that they contain less than 3,000 cords, firms with more than 20 employees are not allowed to bid, and an individual firm cannot purchase more than 25% of the sales on the first round of bidding. These restrictions are meant to give smaller firms more opportunity to purchase stumpage. Given that intermediate sales restrict the number of potential bidders and previous research suggests lower bidder competition will decrease stumpage prices (Vickrey

³² See Section 2.3.4.4 of this report for more information about other states’ efforts to enhance opportunities for smaller businesses to purchase stumpage.

1961; Buongiorno and Young 1984; Bulow and Klemperer 1996; Dahal and Mehmood 2005; Leefers and Potter-Witter 2006), we expected stumpage prices for intermediate sales to be less than those for regular sales with similar characteristics.

To our knowledge, our study is the first comprehensive attempt to analyze the impact the intermediate timber sale process has on stumpage prices. We were only able to find one other example of a public agency explicitly restricting the size of firms that are allowed to bid on sales. USDA-FS set-aside sales restrict bidding to firms with less than 500 employees. As expected, previous empirical research suggests that set-aside sales reduce stumpage prices. Johnson (1979) found that set-aside tracts sold for less than regular tracts when both types of tracts required a large amount of road construction. Weiner (1979) found that set-aside tracts sold for lower prices at oral auctions. Similar to USDA-FS set-aside sales, we expected stumpage prices to be significantly lower for intermediate tracts, primarily due to the fact that many of the strong bidders (i.e., firms with more than 20 employees) were not allowed to bid on these tracts.

Given similar sale characteristics, we found no significant differences between intermediate and regular timber sale prices³³ (Table 6). We also included several interaction variables to identify different marginal effects that may exist between subgroups. For simplicity, we chose not to include the large number of species-product and location variables in our subset of interaction variables. Instead, we included interaction variables for administrative characteristics (e.g., contract length, seasonal operating restrictions, total appraised volume) to identify different marginal impacts on the price paid for stumpage for intermediate and regular sales. None of the interaction variable coefficients were significantly different from zero. In other words, the marginal price impact of total appraised volume, harvest density, contract length, and seasonal operating restrictions was not different for tracts offered at regular and intermediate auctions.

4.4. Summary and Conclusions

An OLS regression model was used to estimate a hedonic price function for MN DNR timber sales (Table 6). Controlling for the species-product composition of a tract, location of a tract, and annual end-product market conditions, we examined the impact the following characteristics had on 2001 to 2006 stumpage prices: season of sale, harvest density, contract length, seasonal operating restrictions, total appraised volume, and intermediate auction.

Season of sale. Fourth quarter sales (October-December) received the lowest prices. Prices were 17% higher for tracts offered in the second quarter (April-June) than the fourth quarter. The reason(s) for this price differential is largely unknown, but other studies suggest the difference could be the result of different levels of competition in the two seasons. We hypothesize that since the majority of timber harvests are conducted in the winter, loggers have a much lower inventory of stumpage contracts in the spring. They may also have more available cash flow after

³³Readers should be aware of the possibility of unobservable timber sale characteristics that (1) have an influence on stumpage prices, and (2) are correlated with the independent variables included in our model. For example, intermediate timber sales may have sale characteristics for which we were unable to account in our model (e.g., stand quality, access). If such a correlation exists, our coefficient estimates of the impact of certain characteristics may be biased. We have no reason to believe intermediate sales are correlated to unobservable variables, but we feel readers should be aware of our model assumptions.

their busiest season. These factors may contribute to an increase in competition and loggers' willingness to pay for stumpage.

Harvest density. A one unit increase in harvest density (cordE/acre) increased MN DNR stumpage prices by 1.6%. A greater harvest density, expressed as appraised volume per unit tract area, may allow operators to harvest more volume in a shorter amount of time with less tree-to-tree travel time for fellers and more efficient bunch sizes created for skidding operations.

Contract length. Timber sale contract length had a significant impact on the price paid for public stumpage from 2001 to 2006. An additional year on a timber sale contract increased stumpage prices by 4%. While the overall impact was significant, the marginal impact of an extra contract year did not change from year-to-year. This result was surprising because we suspected, a priori, that price speculation associated with 5-year contracts was a contributor to 2005 price fluctuations. Our results indicate contract length had an impact on stumpage prices, but the level of influence did not change throughout the period of study—suggesting shorter contracts would have reduced overall stumpage prices during the period in question without eliminating price fluctuations entirely.

Seasonal operating restrictions. Allowing harvest operations on non-frozen ground conditions increases stumpage prices by 7%. The use of seasonal operating restrictions may effectively protect sites vulnerable to environmental degradation, but such restrictions significantly reduce financial returns to the state.

Total appraised volume. Tract size had a significant impact on prices paid for MN DNR stumpage. Prices paid for tracts with 500 to 1999 cordE were significantly lower than large tracts (2000+ cordE) and significantly higher than small tracts (less than 500 cordE). An increase in the size of future timber sales, particularly sales less than 500 cordE, would likely increase average stumpage prices and MN DNR gross revenue. However, the MN DNR has a wide range of management objectives, not simply maximizing revenue. Effective timber sale design must weigh the potential financial advantages of larger timber tracts against other forest management considerations (e.g., vegetative management, wildlife habitat) and a desire to maintain a diverse logging capacity that are able to operate across a broad range of tract volumes offered for sale.

Intermediate vs. regular sales. To our knowledge, this study was the first to analyze the price impact of intermediate timber sales. We expected stumpage prices to be lower for intermediate sales, primarily due to the fact that larger businesses (i.e., large corporations) are not allowed to bid on intermediate tracts. However, we found no significant difference in prices paid for intermediate and regular tracts that shared similar characteristics.

This result has important policy implications. The primary goal of intermediate sales is to enhance equity by giving smaller logging firms an opportunity to purchase wood. Since intermediate sales have no adverse effect on stumpage prices and total revenue, they appear to effectively accomplish the goal of greater equity (i.e., increased opportunities for smaller loggers) by allowing smaller businesses to purchase a large portion of state stumpage without sacrificing financial returns to the state. On the other hand, one could also argue there is no need

for the artificial differentiation of regular and intermediate sales—smaller businesses still pay the same prices for timber, regardless of whether the tract is offered as intermediate or regular.

5. A Paired Bidding Analysis of Reserve Price and Contract Length Effects on MN DNR Stumpage Bids.

5.1. Introduction

We utilized a field experiment methodology called “paired bidding” to supplement information obtained in our hedonic analysis by assessing the impact reserve prices and contract length have on the price paid for MN DNR stumpage. Paired bidding methodology provides an alternative to the hedonic pricing method used in most stumpage price analyses. Kilgore and Blinn (2003) used paired bidding to empirically estimate the effect of timber harvesting environmental guidelines on willingness to pay for stumpage in Minnesota. In their experiment, 27 public tracts were offered for sale at sealed bid auctions. Each tract was offered two different ways: with and without the requirement to follow environmental guidelines. Each bidder was required to submit a bid for each tract version. After all paired bids were submitted, the tract version (i.e., guideline requirements or no guideline requirements) was chosen at random and the tract was awarded to the highest bidder for that version. The process generated 80-paired bids that were used to empirically estimate the impact harvesting guidelines had on stumpage bidding.

The primary advantage of the paired bidding methodology is that it is able to control for the variation of all characteristics of a tract, except the variable of interest (treatment variable). This enables the researcher to empirically observe the marginal effect of a single tract characteristic on willingness to pay for stumpage without having to adjust for the frequent biases associated with incomplete field data and hedonic modeling. Thus, we believed further use of paired bidding methodology could enhance our efforts to estimate the effects of important administrative timber sale characteristics.

Due to data limitations and tenuous modeling assumptions, one timber sale characteristic that could not be included in our hedonic analysis was minimum bid price (i.e., reserve price). A rather large body of theoretical literature discusses the role of reserve prices in auctions (e.g., McAfee and McMillan 1987)³⁴. The classic theoretical auction model developed by Vickrey (1961), and later extended by Riley and Samuelson (1981), suggests sellers can set an optimal reserve price at first-price, sealed bid auctions to extract additional revenue from the highest bidder, beyond that which would accrue merely from competition between bidders. According to Reiley (2006), some of the key predictions from this model are: (1) reserve prices reduce the number of bidders who submit bids by screening out those bidders with low valuations, (2) reserve prices reduce the probability of the good being sold, (3) reserve prices increase the revenue earned on a good, conditional on its being sold, and (4) an increase in the reserve price will cause an increase in the bid for a given bidder. Theoretically, a bidder realizes that an increase in the reserve price will increase the bids of the other bidders who choose to remain in the auction, and he therefore will increase his own optimal bid level as well.

³⁴ This review of theoretical auction literature and reserve prices mirrors a previous summary of literature provide by Reiley (2006).

There has been considerable theoretical work predicting the effects of reserve prices, but relatively little empirical work testing the accuracy of these models in the context of public timber auctions. Most previous empirical stumpage price studies used field data and econometric modeling techniques to evaluate the effect reserve price had on stumpage price. Results from these studies suggest higher reserve prices increase stumpage prices (Buongiorno and Young 1984; Huang and Buongiorno 1986; Sendak 1991; Carter and Newman 1998). However, incomplete data, tenuous model assumptions (Buongiorno and Young 1984) or endogeneity concerns (Carter and Newman 1998) often bring into question the validity of these results.

Paired bidding offers an alternative method by which we could attempt to answer the question: do reserve prices influence bidding behavior and the price paid for MN DNR stumpage? Most public timber sale programs spend a considerable amount of time and effort estimating fair market value for stumpage and developing reserve prices. Since significant public resources are spent in this area, a relevant question is whether or not reserve prices influence bidding behavior and stumpage prices. If reserve prices do not influence bidding behavior, then the only obvious impact of reserve prices is to reduce the number of tracts offered for sale that receive a bid and potentially reduce total sale revenue.³⁵ On the other hand, if reserve prices influence individual bidding behavior, public agencies, and specifically the MN DNR, may want to continue to improve their efforts to set optimal reserve prices.

In addition to reserve prices, we were also interested in assessing the impact of 5-year timber sale contracts on prices bid for MN DNR stumpage. Prior to this study, we hypothesized the combination of 5-year timber sale contracts and price speculation (i.e., the expectation that stumpage prices will be higher in the future) was a major contributor to stumpage price fluctuations. During the period of price fluctuations, many of the MN DNR tracts were offered with 5-year contracts, which allowed purchasers to base their stumpage bids on expectations about future prices five years in the future. Expecting prices to continue to rise, purchasers could place very high stumpage bids and still harvest the timber in a few years at below-market prices.

One proposed change aimed at preventing this type of bidding behavior is greater use of 2 to 3 year contracts. Results from our hedonic analysis, along with results from previous studies, showed that shorter contracts reduced 2001 to 2006 stumpage prices. However, we are unaware of any previous studies that provide an in-depth, empirical analysis of how timber sale contract length affects bid price. Very little is known about how a reduction in contract length would affect the MN DNR's ability to achieve their multiple program goals (e.g., financial returns, vegetative management) or the underlying reasons why purchasers are willing to pay more for a longer contract.

We used a combination of paired bidding methodology and additional survey questions to further our understanding of how reducing contract lengths from five to two years impacts stumpage bids. We analyzed 2-year contracts because they provide a substantial contrast to 5-year contracts. We believed this contrast would potentially reveal subtle differences that may not have been obvious when comparing 5-year and 3-year contracts.

³⁵ This assumes a sale that does not receive a bid has no resale value. In reality, unsold tracts often have resale value.

5.2. Data and Methods

We conducted paired bidding experiments at three MN DNR sealed bid timber auctions from November 2008 through January 2009. Following the paired bidding methodology developed by Kilgore and Blinn (2003) to analyze the effect harvesting guidelines have on stumpage bidding, we analyzed the impact of two timber sale characteristics on willingness to pay for stumpage: reserve price and contract length.

One hundred and forty-eight tracts were advertised for sale at three sealed bid auctions located in the MN DNR's northwest region, northeast region, and Sandstone area (located in the central region); 96 tracts were assigned the reserve price treatment and 52 tracts assigned the contract length treatment.³⁶ Each tract was offered for sale as two versions and bidders were required to submit two bids per tract—one for each version (Figure 17)³⁷. If a tract was part of the reserve price treatment experiment, one version of the tract was offered with the reserve prices determined by the MN DNR (full reserve price); the other version of the tract was offered with a 50% reduction in the reserve price for all bid species contained in the tract (half reserve price). If a tract was part of the contract length treatment experiment, one version of the sale was offered with a 5-year contract length; the other version was offered with a 2-year contract length. By requiring bidders to submit two bids for the same tract, the experimental design controls for all factors influencing stumpage bids except the treatment variable. After all paired bids were submitted, the tract version (i.e., full reserve price or half reserve price; 2-year contract or 5-year contract) was chosen at random and awarded to the highest bidder for that version.

	Version A	Version B
Reserve Price Treatment 66 NW Region Tracts 18 NE Region Tracts 12 Sandstone Area Tracts	Full Reserve Price	Half Reserve Price
Contract Length Treatment 26 NW Region Tracts 21 NE Regions Tracts 5 Sandstone Area Tracts	5-year contract	2-year contract

Figure 17. Paired bidding study design.

Our methodology is similar, but not identical, to a recent study conducted by Reiley (2006). Reiley used field experiment methodology to assess the effects of reserve prices in internet auctions for *Magic* trading cards. The paired bidding methodology used in our study differs from Reiley's (2006) field experiments primarily in the following way: bidders are required to submit

³⁶ The sales were placed in a treatment by MN DNR timber sale administrators. Many of the sales were previously sold in 2005 and subsequently forfeited back to the state when purchasers could not afford to pay the high prices. Since MN DNR officials wanted these sales to be harvested sometime soon, they did not want them in the contract length treatment for fear that they may not be harvested for another five years.

³⁷ See Appendix C for examples of materials used to elicit paired bids for reserve price and contract length treatments.

a bid for each version of the sale. Thus, our experimental design collects more information about changes in individual bidder behavior in response to changes in auction characteristics—a key question when looking at reserve prices. Unfortunately, paired bidding also presents a substantial disadvantage relative to Reiley’s experiment. Since bidders were required to submit bids for both reserve price versions of the sale, we were unable to collect data on how reserve prices impact the probability that a tract is sold. Without this information, it is difficult to assess how a change in reserve price impacts total revenue.

In addition to submitting paired bids, bidders were required to respond to two survey questions. They were asked to estimate: (1) when they expected to harvest the sale; and (2) how stumpage prices would change between the date of sale and the expected date of harvest. Responses to these questions are discussed alongside results from the contract length treatment as part of our analysis of the underlying factors motivating additional willingness to pay and how a change in contract length impacts expected harvest dates.

Aside from the paired bidding process described above, we attempted to keep the auction process as simple and normal as possible for bidders.³⁸ Each auction was advertised for 30 days through the typical MN DNR process (e.g., a website announcement, a press release, an advertisement in each regional office, auction notices mailed to a list of registered bidders). Paired stumpage bids had to be received by the MN DNR within the 30-day period preceding each auction. The notice of sale for each auction also contained a detailed description of the paired bidding study and the bidding requirements.

5.3. Results

Seventy-five reserve price treatment tracts and 36 contract length treatment tracts received at least one complete set of paired bids. In three instances, bidders made obvious mistakes submitting bids (e.g., accidentally switching bids between sale versions³⁹). Where this occurred, bids were corrected and included in the final dataset. Bids not meeting the necessary requirements (e.g., failing to submit bids for both versions, failing to complete the two additional survey questions) were excluded from the final dataset. We received 293 reserve price treatment and 145 contract length treatment usable paired bids. Analysis of the data was performed using SAS 9.2 software. The following two sections describe results from our analysis of these paired bids.

5.3.1. Reserve Prices

Bidders significantly altered their bidding behavior when faced with lower reserve prices (Table 8). Bids were, on average, \$3.06/cord equivalent (cordE), or 15.93%, less for half reserve price versions of the tract than for full reserve price versions. For those tracts receiving at least one set of paired bids, we identified the highest bid (i.e., sale price) for each version. If all tracts were

³⁸ This was not entirely possible due to the prevailing depressed economic conditions at the time of the experiment which substantially reduced bidding activity in some areas. Also, at the time of the experiment, the MN DNR began using regionwide auctions, instead of their typical area-wide auctions. The regionwide auctions were much larger and contained more sales than area auctions. The auction procedures were very similar, but many bidders expressed concerns over the new region-wide auction procedure.

³⁹ All of these occurred in the reserve price treatment. We identified paired bids that were accidentally switched by testing whether, if corrected, the two bids were identical (\$/cordE)—the type of bidding behavior that was very common throughout our experiment.

sold to the winners of the half reserve price versions, stumpage prices would have been \$1.80/cordE (10.03%) less than if all tracts were sold to the winners of the full reserve price versions.

Table 8. Paired bid reserve price treatment summary statistics.

	Full reserve price version	Half reserve price version	(Half-Full) difference	Percent difference
Mean Bid (\$/cordE) (n = 293)	22.38	19.32	-3.06***	-15.93***
<i>St. Dev.</i>	7.39	9.02	4.58	22.40
Mean High Bid (\$/cordE) (n = 74)	23.66	21.86	-1.80***	-10.03***
<i>St. Dev.</i>	9.70	10.81	4.14	22.91

***Statistically different from zero at the 1% level using a paired t-test.

Reserve prices had a significant impact on bidding behavior and sale price, conditional on the tract receiving at least one set of paired bids. For a substantial portion of the bids (43%), reserve prices had little or no impact on bidding behavior (Figure 18). Thirty percent of bids were identical for both versions. On the other hand, many bidders (16%) “bid-up” the tract by an identical amount, leading to a 50% reduction in stumpage bids for half reserve price versions.⁴⁰ Sixty-one percent of the tracts would have sold for lower prices if sold as the half reserve price version instead of the full reserve price version.

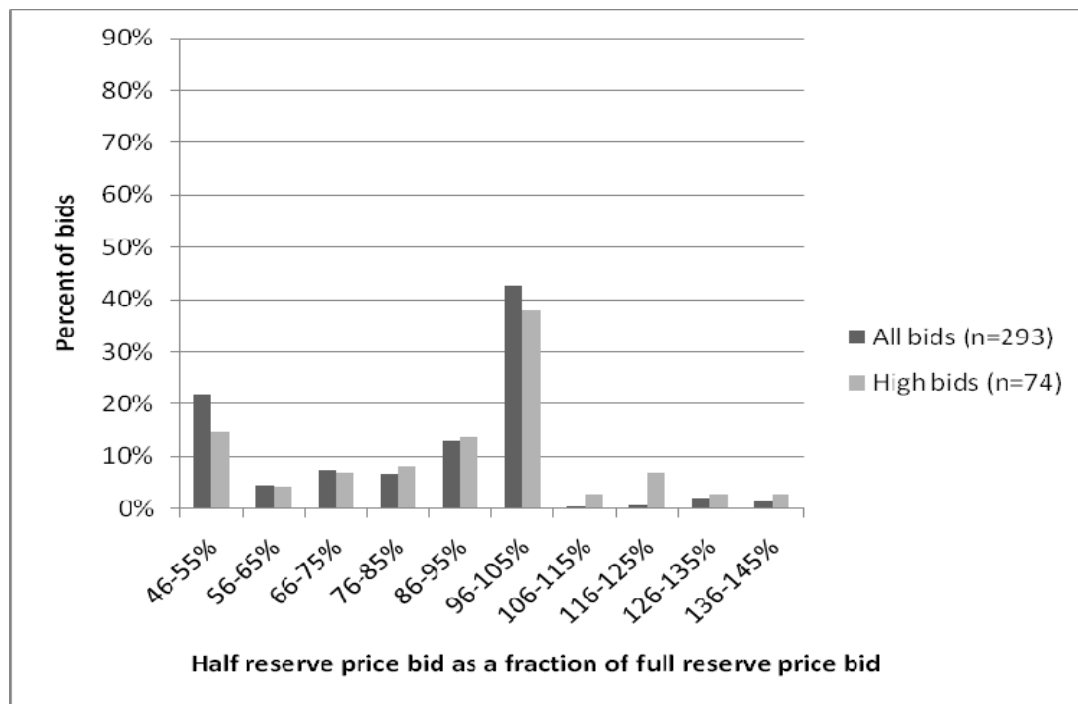


Figure 18. Distribution of reserve price treatment paired bids.

It is important to note that the average sale price differences discussed in this analysis do not imply differences in gross timber sale revenue. Our data do not contain information regarding the number of tracts offered for sale that would have generated revenue (i.e., received a bid) had purchasers been allowed to submit bids for only the half price version of the tract. Our analysis

⁴⁰ “Bid-up” refers to the percent above the reserve price a bidder is willing to pay.

shows that for tracts receiving paired bids in our experiment, half reserve prices would have reduced revenue by 10%. However, under nonpaired bidding conditions, we suspect a portion of unsold tracts offered for sale would have received a bid if they had been offered at the half reserve price. Thus, readers should carefully avoid interpreting average sale price changes as equivalent to gross timber sale revenue changes. Additional data and analysis would be needed to determine the reserve price level that maximizes total gross timber sale receipts.

We used a fixed effects regression model to identify whether the impact of reserve prices was greater for sales with certain characteristics (i.e., sale-specific characteristics), such as volume, density, or location. Fixed effects models are typically used when data contain multiple observations from the same entity (e.g., individual, city, country). In our case, 87 different firms submitted 293-paired bids for the reserve price treatment sales—many of them submitting bids for multiple sales. The variability in differences between reserve price paired bids may be caused by either firm-specific characteristics (variation between firms) or sale-specific characteristics (variation within tract characteristics). Bidding experience and skill, as well as existing stumpage contract inventory, are examples of potential firm-specific characteristics that may contribute to bid differences. However, we wanted to control for these firm-specific characteristics as we looked at whether sale-specific characteristics (e.g., volume, density, location) influenced bidders' responses to a change in reserve prices.

Firm-specific characteristics were largely unobservable and could not be adequately controlled for using basic linear regression techniques. Therefore, we utilized the following fixed effects model to control for unobservable firm-specific characteristics and to identify timber sale characteristics that influenced reserve price bid differences:

$$Y_{ij} = \beta_0 + \beta X_{ij} + \alpha_i + \mu_{ij}$$

where Y_{ij} is the percent difference in reserve price bids⁴¹ by individual i for sale j , X_{ij} is the sale-specific characteristics, α_i is the unobservable firm-specific characteristics, and μ_{ij} is a random error term. We included six sale-specific characteristics (X_{ij}) that we believed could have had an impact on bid differences (Table 9). The data used in this portion of the analysis contained only observations from the 41 firms that submitted bids for more than two reserve price treatment sales. These firms submitted 234 reserve price treatment paired bids on 65 timber tracts.

Results from the fixed effects and ordinary least squares models are shown in Table 10. An F-test revealed that firm-specific characteristics, as represented by an individual dummy variable for each firm, significantly influenced reserve price bid differences. Thus, we favored results from the fixed effects regression model. Moreover, our results suggest firm-specific characteristics were the only factors that influenced reserve price bid differences. After controlling for firm-specific characteristics (e.g., bidder experience and skill, stumpage contract inventory levels), sale-specific characteristics (e.g., density, location, volume) had no significant impact on bid differences. While a change in reserve prices significantly altered individual bidding behavior and stumpage prices, underlying factors driving this change were entirely firm-specific.

⁴¹ Percent difference in reserve bids = (Half reserve price version bid–full reserve price version bid)/Full reserve price version bid)

Table 9. Sale-specific characteristics included in fixed effects model of reserve price bid differences.

Variable	Description
NUMBERBIDS	The number of paired bids received for each sale. This is often used as a proxy for the level of competition for a sale.
CORDSPERACRE	The total volume (cord equivalent) per acre.
Location: {NRegion, NWregion, CentralRegion}	Group of binary variables describing the location of the sale by MN DNR administrative region (NW, NE, or Central).
PRIVATEACCESS	Binary variable that equals one if access to the sale is through private land; equals zero if sale does not require access across private land.
LOGVOLUME	The natural log of the appraised stumpage volume (cord equivalents) for a sale.
REGULARSALE	Binary variable that equals one if the sale was sold at a regular auction; equals zero if the sale was sold at an intermediate auction.

Table 10. Results from reserve price fixed effects and ordinary least squares models (dependent variable = % bid difference; n=234)

Variable	Fixed Effects		OLS	
	Coefficient	S.E.	Coefficient	S.E.
Intercept	-0.2923**	0.1387	-0.0973	0.1569
NUMBERBIDS	-0.0009	0.0031	0.0028	0.0039
CORDSPERACRE	0.0015	0.0015	0.0039*	0.0021
NRegion	-0.0364	0.0636	-0.0126	0.0743
CentralRegion	-0.0711	0.0898	-0.1663**	0.0781
PRIVATEACCESS	-0.0002	0.0326	-0.0273	0.0472
LOGVOLUME	-0.0228	0.0197	-0.0216	0.0231
REGULARSALE	-0.0033	0.0277	-0.0028	0.0369
<i>Mean Percent Bid Difference</i>	-0.1462		-0.1462	
<i>R-square</i>	0.6751		0.0608	

** Significantly different from zero at the 5% level

* Significantly different from zero at the 10% level

5.3.2. Contract Length

On average, bids were \$0.50/cordE (2%) less for 2-year contract length tracts than for 5-year contract length tracts (Table 11). This difference was statistically different from zero, yet practically very small. Similarly, the difference in average sale prices (i.e., high bids) was \$0.89 (3%) and statistically significant, but also quite small.

The large majority (84%) of bids for 2-year contract length versions were within +/-5% of paired 5-year contract length bids (Figure 19). Approximately 27% of paired bids contained a lower bid for a 2-year contract than a 5-year contract. In addition, one-third of tracts would have sold for lower stumpage prices if all sales were sold as 2-year contract versions instead of 5-year contract versions.

Table 11. Paired bid contract length treatment summary statistics.

	5-year contract length version	2-year contract length version	(2-year to 5-year) difference	Percent difference
Mean Bid (\$/cordE) (n = 145)	24.61	24.11	-0.50***	-2.02***
<i>St. Dev</i>	<i>10.36</i>	<i>10.22</i>	<i>1.34</i>	<i>4.93</i>
Mean High Bid (\$/cordE) (n=36)	24.44	23.55	-0.89**	-3.34***
<i>St.Dev.</i>	<i>14.48</i>	<i>13.98</i>	<i>2.10</i>	<i>6.75</i>

***Significantly different from zero at the 1% level.

**Significantly different from zero at the 5% level

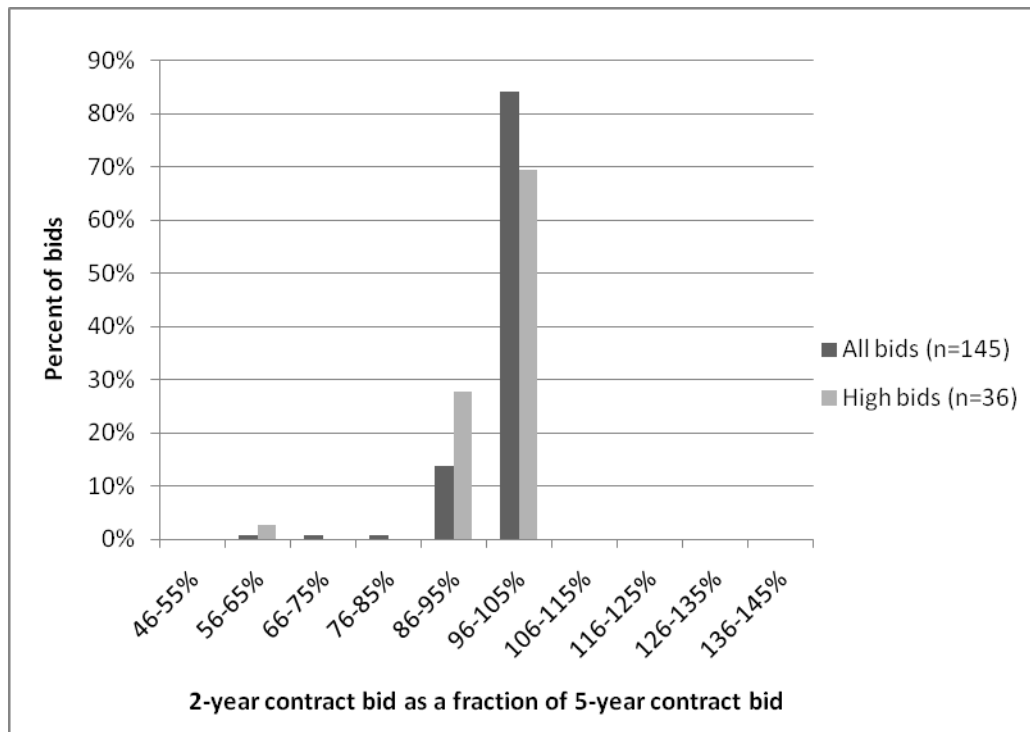


Figure 19. Distribution of reserve price treatment paired bids.

Results from the contract length treatment were surprising. A priori, we expected contract length to have a substantial impact on the price paid for MN DNR stumpage. Our hedonic analysis of 2001-2006 sales showed contract length had a significant effect on stumpage prices. However, contract length had a very small impact on the price paid for stumpage in our paired bidding experiment.

To further understand this result, we analyzed bidder responses to the additional survey questions asking for their expectations about future stumpage prices and harvest dates. First, we asked bidders to indicate the expected amount of time between when they purchased and planned to harvest the tract. Two-year contract versions reduced average expected harvest dates by

approximately 6 months⁴²(Table 12). For the bidders who would have been awarded the tracts under either of the two different contract scenarios (i.e., high bidders for each contract version), the 2-year contract reduced average expected harvest dates by 0.80 years.

Table 12. Summary of bidders' expectation about the time between the date of sale and the expected harvest date.

	5-year contract	2-year contract	(2-year to 5-year) difference
Average of all bids (years) (n = 145)	1.95	1.40	-0.55***
<i>St. Dev.</i>	<i>1.12</i>	<i>0.55</i>	<i>0.93</i>
Average of high bids (years) (n = 36)	2.13	1.33	-0.80***
<i>St. Dev.</i>	<i>1.39</i>	<i>0.60</i>	<i>1.09</i>

***Significantly different from zero at the 1% level.

A closer look at expected harvest dates for 5-year contracts revealed that 75% of all bidders expected to harvest sales within two years (Figure 20). Two-year contracts shortened the expected harvest date for 28% of all bidders. For the bidders who would have been awarded the tract under each of the different contract version scenarios, the purchasers of 2-year contract versions expected to harvest 36% of the sales at an earlier date than the purchasers of the 5-year contract versions.

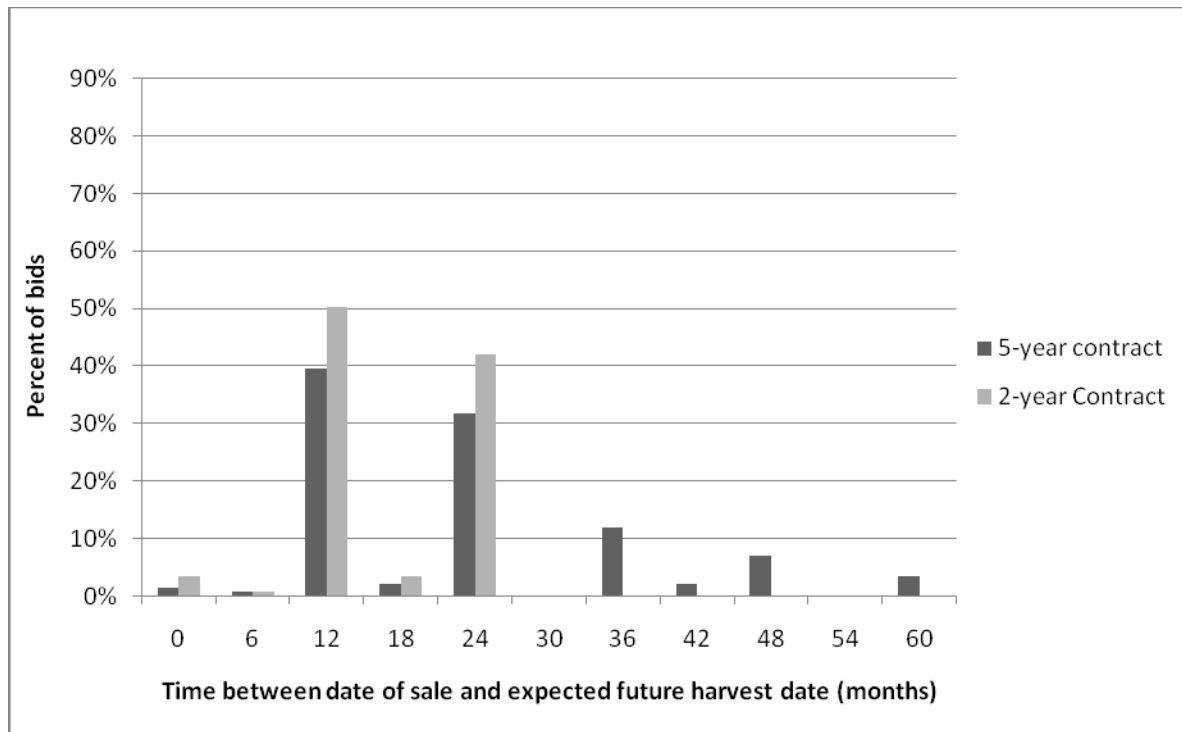


Figure 20. Distribution of bidders' expected harvest date (n=145).

⁴² Twenty-one bidders submitted three or more contract length paired bids, generating only 74 usable paired bids—not enough to generate useful results from a fixed effects regression model.

We also asked bidders to describe their expectations about future stumpage prices. On average, bidders expected a 6.5% reduction in stumpage prices between the date of sale and the date they expected to harvest the tract, or 4.9% per year (Table 13).

Table 13. Summary of bidders' expectation about changes in future stumpage prices.

	Between date of sale and expected 5-year harvest date	Between expected 2-year and 5-year harvest date
Average expected stumpage price change (%) (n = 145)	-6.51***	0.06
<i>St. Dev.</i>	14.56	7.66

***Statistically different from zero at the 1% level.

Most bidders expected stumpage prices to decrease or remain steady for the foreseeable future (Figure 21). Also, no significant difference existed between the expected stumpage prices at the time of harvest for 2-year contracts and the time of harvest for 5-year contracts (Table 13). This suggests bidders were not including a speculative component in their stumpage bids. In general, bidders did not expect a 5-year contract to give them any additional value associated with long-term (three additional years) market stumpage price increases.

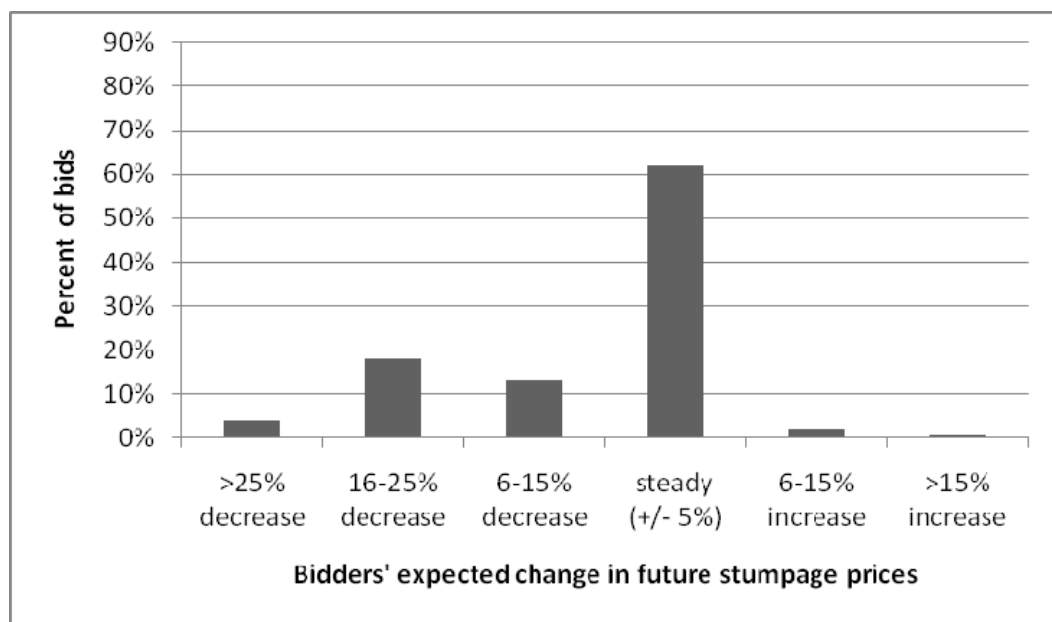


Figure 21. Distribution of bidders' expectations about changes in stumpage prices before harvest date (n=145).

5.4. Summary and Conclusions

We used paired bidding methodology to analyze the impact of reserve price and contract length on willingness to pay for MN DNR stumpage in November 2008-January 2009. By requiring bidders to submit two bids for the same timber tract, the experimental design controlled for all factors influencing stumpage bids except the variable of interest. In addition to submitting paired bids, bidders were required to respond to two additional survey questions that asked them to estimate: (1) when they would harvest the sale; and (2) how stumpage prices would change between the date of sale and their expected date of harvest.

Reserve prices. Reserve prices had a significant impact on bidding behavior and MN DNR stumpage prices. A 50% reduction in reserve prices reduced average stumpage bids by approximately 16%, and reduced average selling prices by 10%. The result was consistent with classic auction theory predictions, but the paired bidding nature of this study yielded more complete information about changes in individual bidding behavior in response to changes in reserve prices than previous empirical studies. Changes in bidding behavior were found to be entirely firm-specific. Sale-specific characteristics, such as volume, density, or location, were not significant predictors for the impact of reserve prices on bidding behavior.

These results have important implications for public timber sale design, particularly in Minnesota. Public timber sale programs often spend considerable staff resources estimating fair market value for stumpage and developing reserve prices. Results from our analysis suggest that efforts to establish reserve prices are well justified. Reserve prices have a significant influence on bidding behavior, conditional stumpage prices, and gross revenue. With this in mind, the MN DNR should continue to set reserve prices if they wish to maximize gross timber sale revenue and, where possible, look for ways to refine the process used to establish reserve prices. In order to set reserve prices that maximize gross timber sale revenue, more information is needed about the impact reserve prices have on the probability a sale receives at least one bid. Any future decisions regarding reserve prices should consider the impact reserve prices have on financial returns, as well as their impact on the agency's ability to complete silvicultural prescriptions and achieve other forest management goals (e.g., vegetative management, wildlife habitat).

Contract length. By analyzing paired bidding data and responses to additional survey questions, we were able to conduct an in-depth analysis of stumpage purchasers' willingness to pay for longer contract lengths. Results from our paired bidding experiment showed that a reduction in contract length from five to two years lowered average sale prices by 3%, or approximately 1% per year—an effect that was statistically significant, but practically small. This difference was substantially lower than 2001 to 2006 sales from the hedonic analysis, where each additional contract year increased the price paid for stumpage by approximately 4%. One potential explanation for this difference was a change in bidders' expectations about future stumpage prices. Unlike past years, price speculation was not a significant factor in bidding behavior during the 2008-09 paired bidding study. On average, bidders expected stumpage prices for MN DNR timber sales to decrease by 6.5% between the date of sale and the expected harvest date.

In a period when stumpage price speculation was not prevalent, 2-year contracts encouraged earlier harvests. A significant number of purchasers planned to conduct harvests at an earlier date when purchasing a 2-year contract instead of a 5-year contract. Two-year contracts reduced expected harvest dates for approximately 36% of the sales and reduced average expected harvest dates by approximately 6 to 9 months. In addition, the statistically significant, yet practically small, difference in bids between 2- and 5-year contracts suggests that any harvest planning changes caused by shorter contracts had very little impact on purchasers' willingness to pay for timber.

When price speculation is not prevalent, shorter contracts encourage earlier harvests, but at very little financial cost to stumpage purchasers. This result provides useful information to program administrators attempting to improve public timber sale design and administration. Shorter

contracts can be used to reduce price speculation in timber markets. In addition, from a land management perspective, shorter contract lengths encourage prompt timber harvests, making it easier for public agencies to control the timing of forest management activities. The earlier harvest activities appear to be a minor inconvenience to stumpage purchasers' harvest planning efforts.

6. Importance of Tract Attributes on Bid Price and Bidding Behavior

This chapter describes how stumpage purchasers and the administrators of state-administered timber tracts offered for sale within the Lake States (MN, MI, and WI) each view the importance various tract attributes have on bid price and bidding behavior for department of natural resources (DNR) stumpage sold at public auction.⁴³ The chapter is based on the results of two related mail surveys, both conducted in early fall 2009. In one, the buyers of DNR stumpage in the Lake States (e.g., loggers, procurement foresters, wood brokers, hereafter referred to as “loggers”) were surveyed. In the other, DNR foresters in the three states responsible for establishing and administering tracts offered for sale were surveyed. Each questionnaire asked the respective survey recipients to characterize how different timber tract attributes (e.g., tract contract provisions, tract characteristics, and administrative procedures) changed in importance as economic conditions changed. Logger and DNR forester attitudes and perceptions about timber sale characteristics and factors influencing stumpage bids were requested in 2009 with respect to three distinct points in time: (1) the economic climate characterized by depressed stumpage markets at the time the survey was administered (August-September 2009); (2) stumpage markets in 2005 when stumpage prices were at historic highs; and (3) during a generally “stable” economic environment for stumpage markets as was witnessed in the Lake States from 1995 to 2003 (Figure 22).

6.1 Data and Methods

Separate questionnaires were developed for DNR foresters and loggers (Appendices D and E). The “logger questionnaire” requested information from purchasers of DNR tracts offered for sale on the following topics:

- how frequently various characteristics (e.g., regulations, access, proximity to other tracts) were observed on DNR tracts offered for sale during the three points in time,
- the importance, as perceived by loggers, that DNR foresters place on those same characteristics when setting up and/or administering tracts offered for sale during the three points in time,
- the importance placed on various timber tract characteristics when bidding on DNR timber tracts offered for sale during the three points in time,
- the three most important timber tract characteristics when bidding on tracts,
- what an ideal DNR timber tract offered for sale would look like (e.g., area and volume offered for sale, number of product markets, contract length, method of auction, method of payment), and

⁴³ In this chapter (Chapter 6), DNR refers to the MN DNR, WI DNR, and MI DNR.

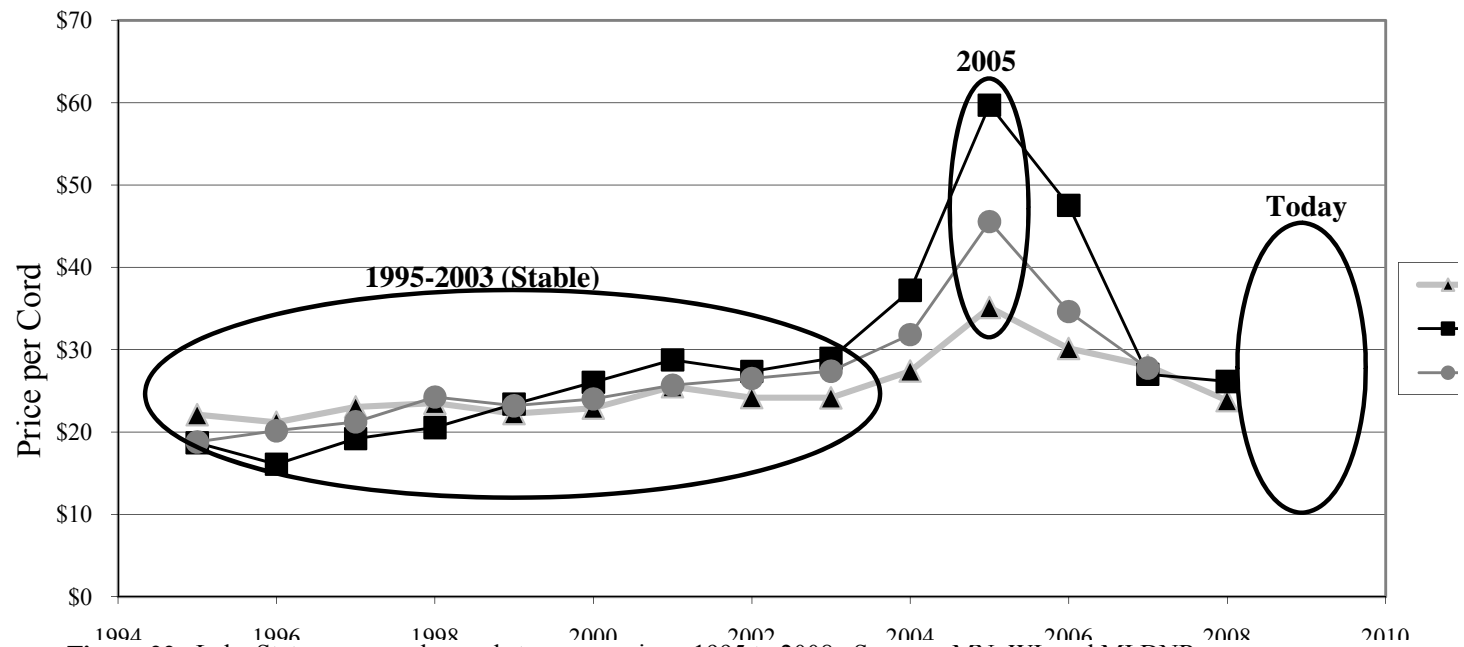


Figure 22. Lake States aspen pulpwood stumpage prices, 1995 to 2008. Sources: MN, WI, and MI DNR.

- perspectives on sealed bid versus oral auctions and lump sum (SOAV) versus consumer scale tracts, and background information on the survey respondent's logging operation in 2008 (e.g., job title, years in the logging/wood buying business, number of full-time and part-time employees, number of product markets, approximate volume purchased from the DNR,
- product type harvested from DNR lands, percent of stumpage harvested from various sources).

The “forester questionnaire” requested information from MN, MI, and WI Department of Natural Resources foresters on the following topics:

- how frequently various characteristics (e.g., regulations, access, proximity to other tracts) were observed on DNR tracts offered for sale during the three points in time,
- the relative importance placed on the same tract characteristics during the three points in time when setting up and/or administering DNR tracts offered for sale,
- the importance, as perceived by DNR foresters, that loggers place on a number of tract characteristics during the three points in time,
- the three most important tract characteristics considered when setting up tracts that will be offered for sale,
- what an ideal DNR tract would look like from a logger's perspective (e.g., area and volume of the tract offered for sale, number of product markets, contract length, method of auction, method of payment),
- perspectives on sealed bid versus oral auctions and lump sum (SOAV) versus consumer scale tracts, and
- background information on the survey respondent (e.g., job title, years with the MN DNR, number of timber tracts set up and/or administered in 2008).

The questionnaires were designed in parallel such that perceptions between “loggers” and “foresters” could be directly compared and contrasted. The parallel construction was closely followed for the questions requesting perspectives during three distinct market conditions as well as questions on what an ideal tract offered for sale would look like to a logger, perceived differences between sealed bid and oral auctions, and perceived differences between lump sum (SOAV) and consumer scale tracts.

Once draft logger and forester questionnaires were prepared, separate focus groups with Minnesota loggers and MN DNR foresters and were conducted in Grand Rapids, MN. The purpose of the focus groups was to pretest the questionnaires, specifically to obtain feedback on the usefulness and understandability of the survey questions and ensure the data being requested could be provided in a useable format. Prior to conducting the focus groups, project staff developed outlines that would be used to guide the discussion of each focus group. While participants in the logger focus group consisted of logging business owners, MN DNR staff with varying titles (program foresters, foresters, forest technicians) participated in the forester focus group. Feedback from the focus groups was evaluated and used to finalize the logger and forester questionnaires.

The DNR in MN, MI, and WI were contacted to obtain the names of individuals and entities who bid on DNR tracts offered for sale in their respective state within the past five years. Because none of the agencies manage a database of tract bidders, lists were provided of all individuals and entities who currently receive information on DNR tracts offered for sale in their respective state. Similarly, those DNR organizations were asked to provide lists of employees responsible for setting up and administering tracts offered for sale in their agency. Separate logger and forester contact lists were developed and finalized from the information provided by the state agencies. The logger questionnaire was sent to 1,382 individuals or entities who received information on DNR tracts offered for sale in the three states (785 in MI, 298 in MN, 299 in WI). The forester questionnaire was sent to 324 DNR personnel in MN, MI, and WI holding the job title “forester,” “field forester,” and “forestry technician” as well as those identified as being involved in administering timber tracts (46 in MI, 162 in MN, 116 in WI).

The survey was administered between August and September 2009 and generally followed the methods described by Dillman (2007). This included seven sequential mailings of the following information to the two groups of survey participants: (1) initial contact letter; (2) study questionnaire and cover letter; (3) reminder postcard; (4) second questionnaire and cover letter; (5) reminder postcard; (6) third questionnaire and cover letter; and (7) final reminder postcard. Separate databases containing the responses from the logger and forester surveys were developed in Microsoft Office Excel 2003. Quality control of data entry was performed by error checking randomly selected logger and forester response records. Of the 40 records error-checked in their entirety, one field of one record was incorrectly coded, suggesting a high degree of data entry accuracy.

Of the initial 1,382 loggers who were sent the logger questionnaire, 58 were undeliverable due to incorrect mailing addresses. Of the 1,324 loggers who were actually contacted, 551 (42%) responded and 394 (30%) provided completed questionnaires that were determined to be useable. By state, usable logger responses ranged from 20% in MI to 52% in MN. From the initial 324 sampled DNR foresters, five were undeliverable due to incorrect addresses, retirement, or the individual was no longer working for the DNR, resulting in 319 DNR foresters actually being contacted. Of these, 261 (81%) returned the forester questionnaire of which 231 (70%) were determined useable. The useable response rate by state was 70% for MI and 71% for MN and WI. Single-factor ANOVA tests identified significant changes ($p \leq 0.05$) for an individual characteristic across the three time periods. T-tests were used to identify significant differences ($p \leq 0.05$) when contrasting logger and forester ratings.

6.2 Results

6.2.1 Profile of Loggers

Table 14 presents a 2008 profile of the purchasers of MN, MI, and WI DNR stumpage who responded to the survey. The majority (77%) of survey respondents were loggers, with an average of nearly 27 years of experience in the industry. While 60% purchased no more than 20% of their DNR stumpage through a sealed bid auction format, 31% purchased more than 80% of their stumpage through that format. There was a similar split for contracts purchased as lump sum. The proportion of loggers who paid for DNR stumpage on a lump sum basis (versus consumer scale) also varied, with nearly two-thirds of respondents indicating less than 20% was sold as lump sum. Three of ten respondents indicated that more than four-fifths of the stumpage

they purchased from the DNR was paid for as a lump sum. The variability in both the method of auction and the method of payment reflects the different timber sale policies used in the three states.

Table 14. Selected characteristics of MN, MI, and WI loggers who bid on DNR timber tracts offered for sale, 2008.

Employment category	Independent logger	Employed by wood products manufacturing company	Wood broker	Other		
N=382	296	51	8	27		
Average years experience (years)	27	12				
Percent of state DNR stumpage purchased through a sealed bid auction format	0-20	21-40	41-60	61-80	81-100	
Percent	60	5	2	2	31	
Percent of DNR timber contracts purchased as lump sum	0-20	21-40	41-60	61-80	81-100	
Percent	63	3	2	2	30	
Number of different timber markets for DNR wood	5					
Products harvested from DNR tracts	Pulpwood	Sawtimber	Other			
Percent	66	24	10			
Stumpage source by ownership class	Federal	State DNR	County/municipal	Family forest	Industrial	Other
Percent	5	27	16	31	6	15

6.2.2 Profile of DNR Foresters

The majority of DNR personnel in MN, MI, and WI who responded to our survey were field foresters (66%), with 24% employed as forestry technicians (Table 15). Tenure with the DNR among the survey respondents was considerable, averaging over 16 years. Like the loggers who responded to our questionnaire, most foresters sold either minimal or nearly all of their tracts using a sealed bid format. While 48% indicated very little (up to 20%) DNR stumpage was sold via sealed bid, just over one-third also indicated more than 80% of the DNR tracts they set up and/or administered were sold using that method. Nearly seven in ten foresters sold up to 20% of their tracts on a lump sum payment basis, yet 19% sold the vast majority (>80%) of their tracts using this payment method. These differences are most likely due to each state's predominant timber sale auction format and payment method practices.

Table 15. Selected characteristics of foresters who set up and/or administered timber tracts on MN, MI, and WI DNR lands, 2008.

Employment category	Technician	Forester	Other		
N=190	46	126	18		
Average years with the DNR	16.4				
Percent of timber tracts offered through a sealed bid auction format	0-20%	21-40%	41-60%	61-80%	81-100%
Percent	48	9	3	4	36
Percent of timber tracts sold lump sum	0-20%	21-40%	41-60%	61-80%	81-100%
Percent	69	5	4	3	19
Number of timber tracts set up and/or administered per year	9.2				

6.3 Perceived Frequency of DNR Timber Tract Characteristics

The purchasers of DNR stumpage (e.g., loggers) were asked to indicate, from their perspective, the frequency by which DNR tracts offered for sale contain 13 physical, contractual, and tract characteristics. Of the 13 tract characteristics evaluated, 8 were expected to have the potential to positively impact the profitability of the tract, either by decreasing harvesting and/or transport costs (e.g., *close to markets for my timber*), increasing revenue (e.g., *contain only marketable species*), or affording greater operator flexibility (e.g., *contracts exceeds four years*) (Table 16). The remaining five characteristics were expected to have the potential to negatively impact tract profitability either through increased harvesting costs (e.g., *needs considerable road development*) or costs associated with purchasing the timber (e.g., *substantial bid guarantee or down payment*). Loggers were asked to provide their perspectives on how frequently these characteristics are associated with DNR tracts offered for sale from the three distinct points in time. Survey respondents were instructed to evaluate the frequency of these tract characteristics on a 5-point Likert scale, with a value of “1” assigned to a characteristic perceived to have a very low frequency of occurrence and a value of “5” assigned to a characteristic believed to have a very high frequency of occurrence. Only respondents who provided answers across all three time periods in this question were included in the analysis. The focus of this analysis is on those tract characteristics that were perceived to change significantly ($p \leq 0.05$) over the three economic periods evaluated.

Table 16. Expected impact of tract characteristic on tract profitability from the loggers' perspective.

Characteristic	Expected impact on profitability
Contracts exceed 4 years	+
High total timber volume	+
Summer logging access	+
High volume of quality wood	+
Close to markets for my timber	+
Contain only marketable species	+
Has restrictive timber sale regulations	-
Needs considerable road development	-
Likely to have low bidding competition	+
Substantial bid guarantee or down payment	-
Sold using sealed bid auction	-
Close to my other timber sales	+

6.3.1 Logger Perspectives

Figure 23 identifies the mean ratings of 281 loggers regarding their perceived frequency of different DNR tract characteristics over the three economic periods. The perceived frequency of seven of the 13 tract characteristics that were evaluated changed significantly over the three time periods. Five of these seven characteristics (*contracts exceed 4 years*, *summer logging access*, *high volume of quality wood*, *close to markets for my timber*, *contain only marketable species*) exhibit downward trends. That is, their frequency was perceived to be less common today than in the past. These five tract characteristics all have the potential to increase tract profitability, yet were seen by loggers as being not commonly associated with DNR tracts offered for sale in the current economically-challenging market conditions. The other two tract characteristics (*has restrictive timber sale regulations*, *substantial bid guarantee or down payment*) were perceived to significantly increase in frequency over time. These two factors, which could decrease logging profitability, were perceived by loggers to be more commonly associated with DNR tracts offered for sale in today's difficult economic climate as compared to the other economic periods evaluated. None of the seven tract characteristics loggers perceived to have changed significantly in frequency over time changed in a way that would economically benefit loggers. That is, those that decreased in frequency are those that can increase logging profitability; those that increased in use over time can decrease logging profitability.

6.3.2 DNR Forester Perspectives

DNR foresters were asked to indicate how frequently their tracts offered for sale contain the same 13 characteristics evaluated by loggers, using the identical 5-point Likert scale (Figure 24). Only four of the 13 characteristics exhibit significant change ($p \leq 0.05$) over the same three economic periods evaluated. Like the loggers, DNR foresters believed tracts offered for sale with *contracts exceeding four years*, *containing high quality wood*, and *containing only marketable species* decreased in frequency over time. Foresters also felt that the frequency of DNR tracts offered for sale with *low bidding competition* is significantly higher in today's depressed timber markets than during stable and robust stumpage market conditions—a condition that could improve the profitability of a tract by reducing the cost of stumpage.

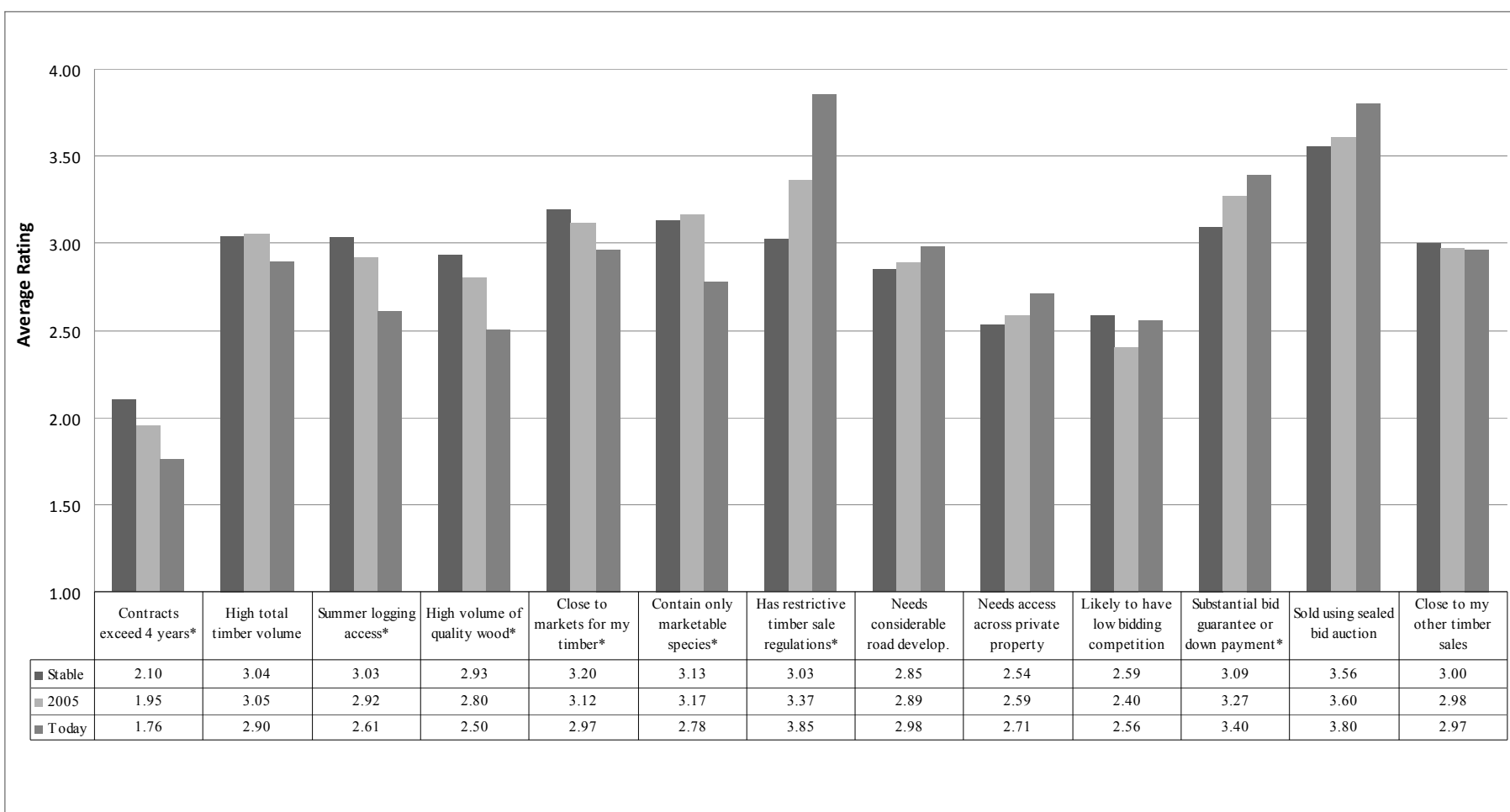


Figure 23. Frequency of DNR tract characteristics as perceived by loggers during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean scores based on a 5-point Likert scale where 1 = characteristic has very low frequency; 5 = characteristic has very high frequency. “*” indicates significant differences in one or more means at $p \leq 0.05$. (N = 281)

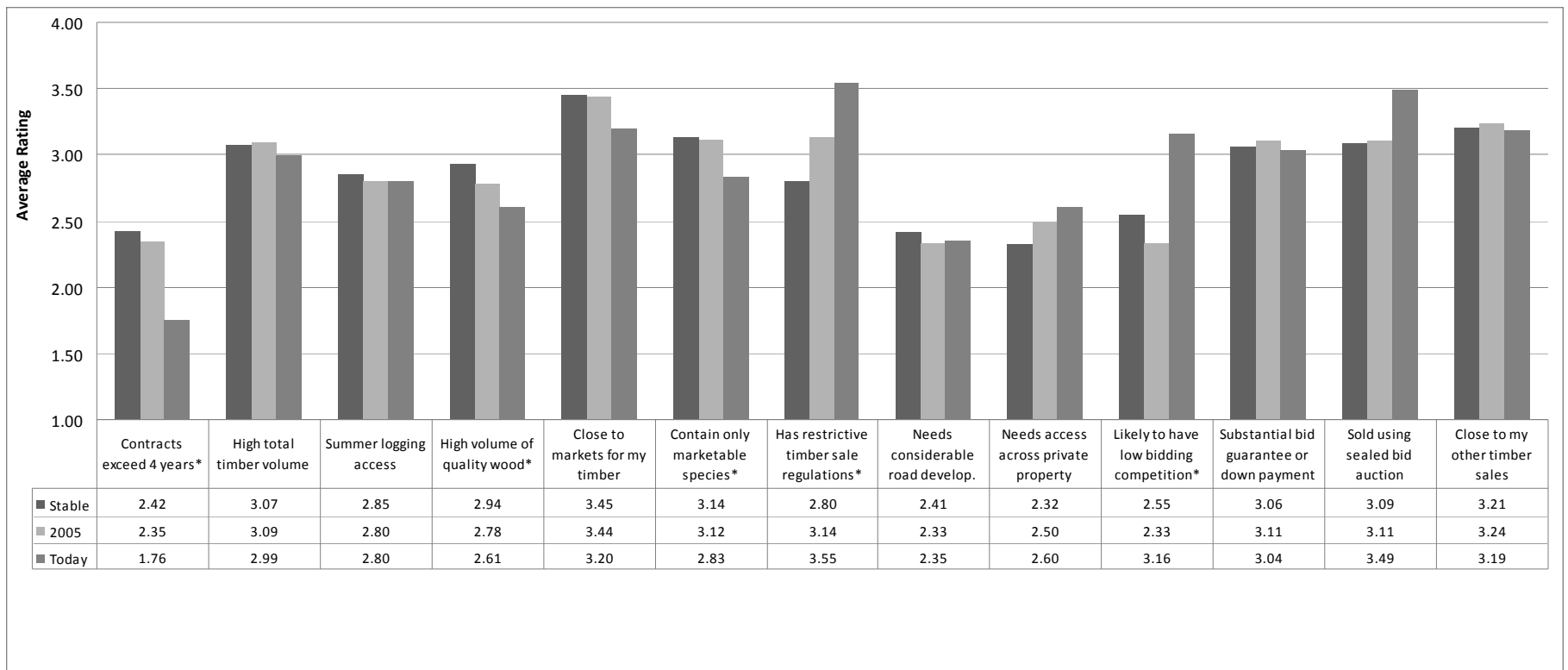


Figure 24. Frequency of DNR tract characteristics as perceived by MN, MI, and WI DNR foresters during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean scores based on a 5-point Likert scale where 1 = characteristic has very low frequency; 5 = characteristic has very high frequency. “*” indicates significant differences in one or more means at $p \leq 0.05$. (N = 139)

6.3.3 Contrasting Logger and DNR Forester Perspectives

Figure 25 contrasts the perspectives of loggers and DNR foresters regarding the frequency by which DNR tracts offered for sale reflect these 13 characteristics. Positive values indicate loggers perceive that the characteristic is more common to DNR tracts than do DNR foresters. DNR tracts *containing restrictive regulations, requiring considerable road development, and sold using a sealed bid auction format* were considered significantly more common ($p \leq 0.05$) by loggers than DNR foresters over all three economic periods evaluated. Loggers also believed there was a greater use of *substantial bid guarantees or down payments* for purchased DNR tracts than did foresters, but this difference was only significant during today's weak economic climate. DNR foresters, in contrast, felt that more of their tracts offered for sale were *close to the logger's wood product markets* and *close to existing tracts* than did loggers. The difference in the perceived frequency of these two tract attributes was significant ($p \leq 0.05$) across all three economic periods. DNR forester perspectives regarding the frequency of their tracts *having low bidding competition* was also significantly higher than the perspectives of loggers, but only during today's economic environment. Foresters also believed that prior to today's market conditions, tract *contracts exceeding four years* was a more common occurrence than did loggers during the same two economic periods.

6.4 Perceived Importance DNR Foresters Place on Tract Characteristics

Loggers were asked to indicate, from their perspective, the importance they thought DNR foresters place on the same 13 physical, contractual, and sale characteristics used in the previous question. Their perspectives were sought from the three distinct economic conditions used in the preceding question. Survey respondents were instructed to evaluate the frequency of these tract characteristics on a 5-point Likert scale, with a value of "1" assigned to those characteristics perceived to have a very low importance and "5" assigned to those characteristics perceived to have a very high importance. Only respondents who provided answers across all three time periods in this question were included in the analysis. The focus of the analysis is on those logger perceptions of DNR forester views that changed significantly ($p \leq 0.05$) over the three economic periods.

6.4.1 Logger Perspectives

Figure 26 identifies the mean ratings 294 MN, MI, and WI loggers assigned regarding the importance they feel DNR foresters place on different tract characteristics over the three different economic periods. The perceived frequency of only three of the 13 tract characteristics evaluated changed significantly over the three time periods. Two of these three (*summer logging access, high volume of quality wood*) exhibit downward trends, meaning their importance to DNR foresters was perceived to be lower today when compared to the past. Both characteristics have the potential to increase the profitability of tracts offered for sale. The other tract characteristic (*tract has restrictive regulations*) was perceived by loggers to significantly increase in importance among DNR foresters over time. This factor has the potential to decrease logging profitability. None of the three tract characteristics perceived by loggers to significantly increase or decrease in importance to DNR foresters when setting up tracts changed over time in a way that would economically benefit loggers. That is, those that decreased in importance are those that can increase logging profitability; the one that increased in importance over time can decrease logging profitability.

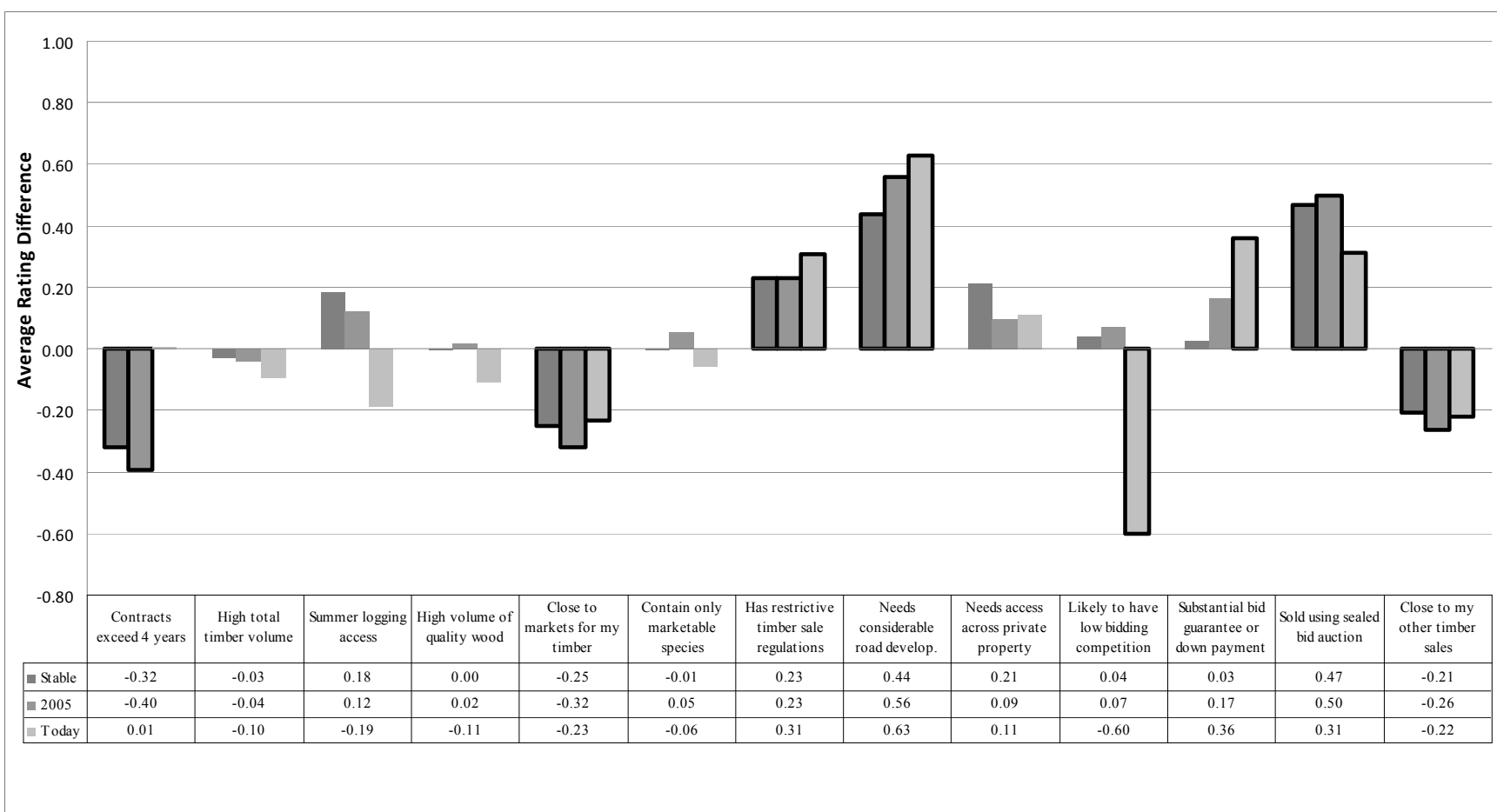


Figure 25. Differences between logger and DNR forester perceptions of frequency of DNR tract characteristics during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean logger score minus mean DNR forester score based on a 5-point Likert scale where 1 = characteristic has very low frequency; 5 = characteristic has very high frequency. Significant differences ($p \leq 0.05$) in mean scores are shown as bordered bars.

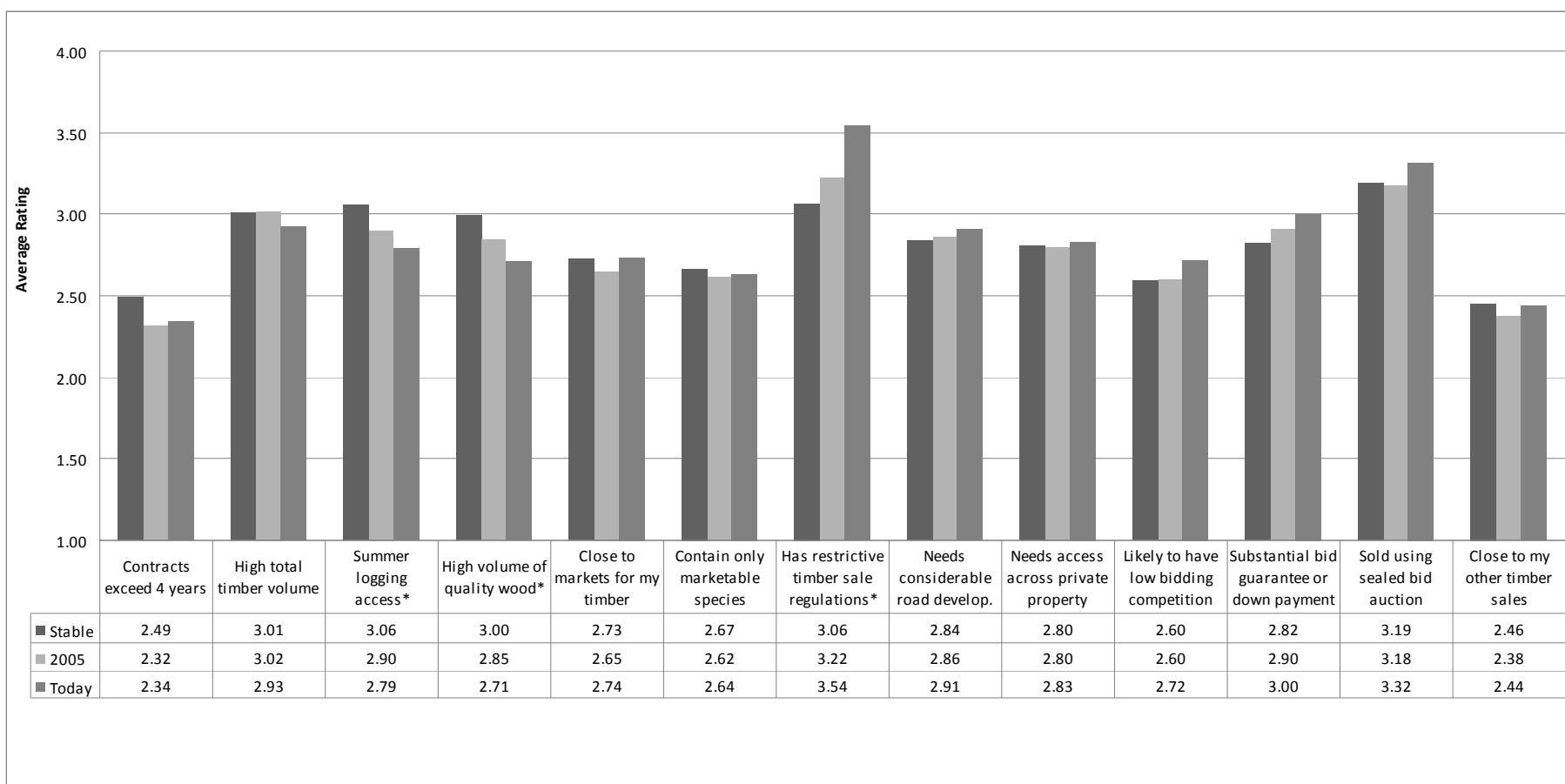


Figure 26. Importance DNR foresters place on tract characteristics as perceived by loggers during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean scores based on a 5-point Likert scale where 1 = characteristic has very low importance; 5 = characteristic has very high importance. “*” indicates significant differences in one or more means at $p \leq 0.05$. (N = 294)

6.4.2 DNR Forester Perspectives

DNR foresters in MN, MI, and WI were asked to indicate the importance they place on a DNR tract containing the same 13 characteristics evaluated by loggers, using the identical 5-point Likert scale (Figure 27). Among the 145 responding foresters, only three of the 13 characteristics exhibit significant changes ($p \leq 0.05$) over the same three economic periods evaluated. These characteristics are: *close to markets for my timber*, *contain only marketable species*, *has restrictive regulations*. *Tracts with restrictive timber sale regulations* was the only factor perceived by loggers and indicated by DNR foresters to be experiencing significant change over the three periods. Like loggers, DNR foresters believed *tracts with restrictive regulations* has increased in importance over time. Foresters also thought the importance they place on *tracts that are close to product markets* and those that *contain only marketable species* increased over time. Both of these factors have the potential to increase the logger's profitability when operating the sale.

6.4.3 Contrasting Logger and DNR Forester Perspectives

Figure 28 contrasts the perspectives of loggers and DNR foresters regarding the importance DNR foresters place on these 13 characteristics when setting up and administering DNR tracts offered for sale. Positive values indicate loggers believe DNR foresters place greater importance on the tract attribute than the importance DNR foresters actually place on that attribute. DNR tracts having *timber sale contracts more than four or more years* and those *sold using sealed bid auction format* were viewed by loggers to be significantly more important ($p \leq 0.05$) to DNR foresters than the actual importance DNR foresters placed on these sale attributes. This difference is significant over all three economic periods evaluated. Loggers also felt DNR foresters placed greater importance on *tracts with restrictions* than the importance DNR foresters actually attributed to this sale characteristic during the two most recent economic periods evaluated (i.e., 2005 and today). DNR foresters, in contrast, place significantly greater actual importance on several tract characteristics than loggers think is the case. They include *tracts that have high total timber volume*, *summer logging access*, *high volume of quality wood*, *only marketable species*, and *are close to other tracts owned by the logger*. The difference in the actual versus perceived importance DNR foresters place on all six of these tract characteristics was significant during the current depressed economic climate. DNR foresters also placed significantly *greater importance on summer access tracts* in 2005 when stumpage prices were at record highs than the importance loggers thought state DNR foresters placed on summer access tracts. The emphasis on tracts offered for sale which are *close to other tracts owned by the logger* was also emphasized by DNR foresters more so than what was thought to be the case by loggers across all three stumpage market conditions evaluated.

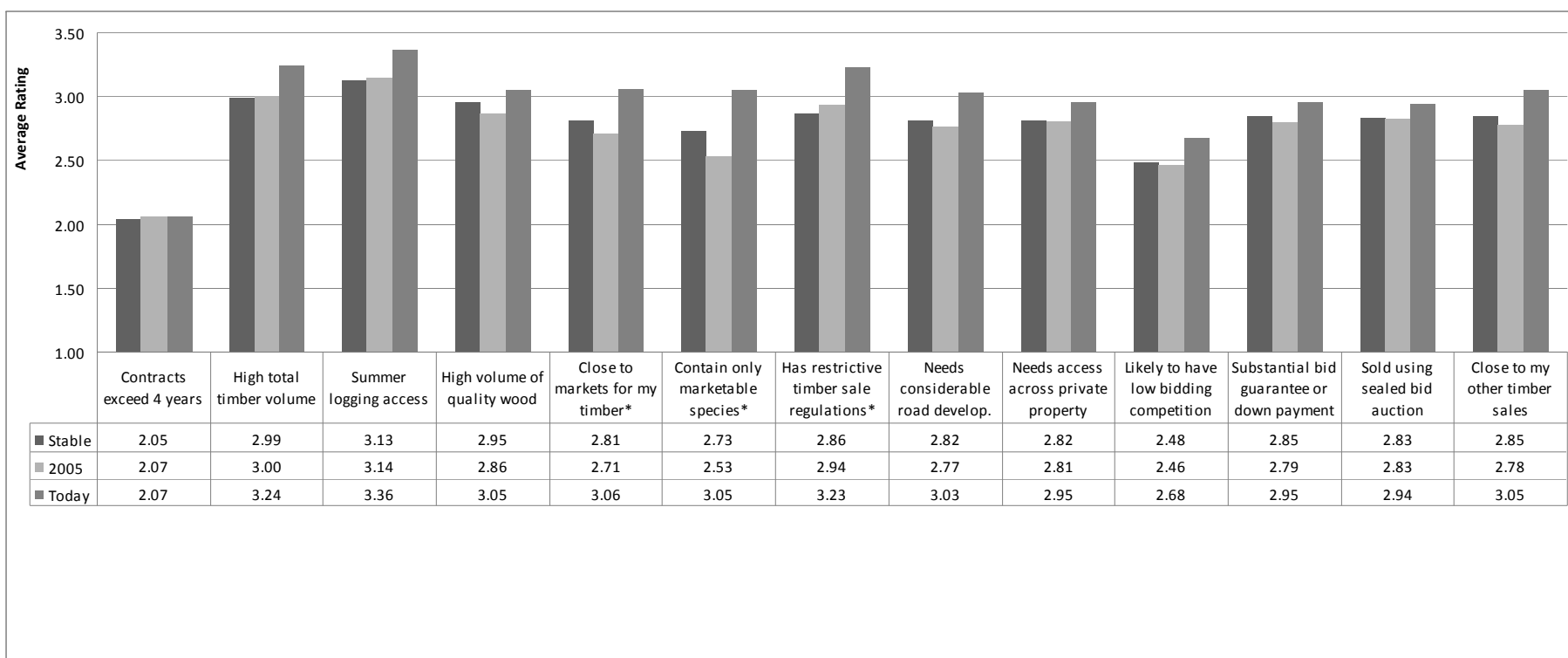


Figure 27. Importance of DNR tract characteristics as perceived by MN, MI, and WI DNR foresters during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean scores based on a 5-point Likert scale where 1 = characteristic has very low importance; 5 = characteristic has very high importance. “*” indicates significant differences in one or more means at $p \leq 0.05$. (N = 145)

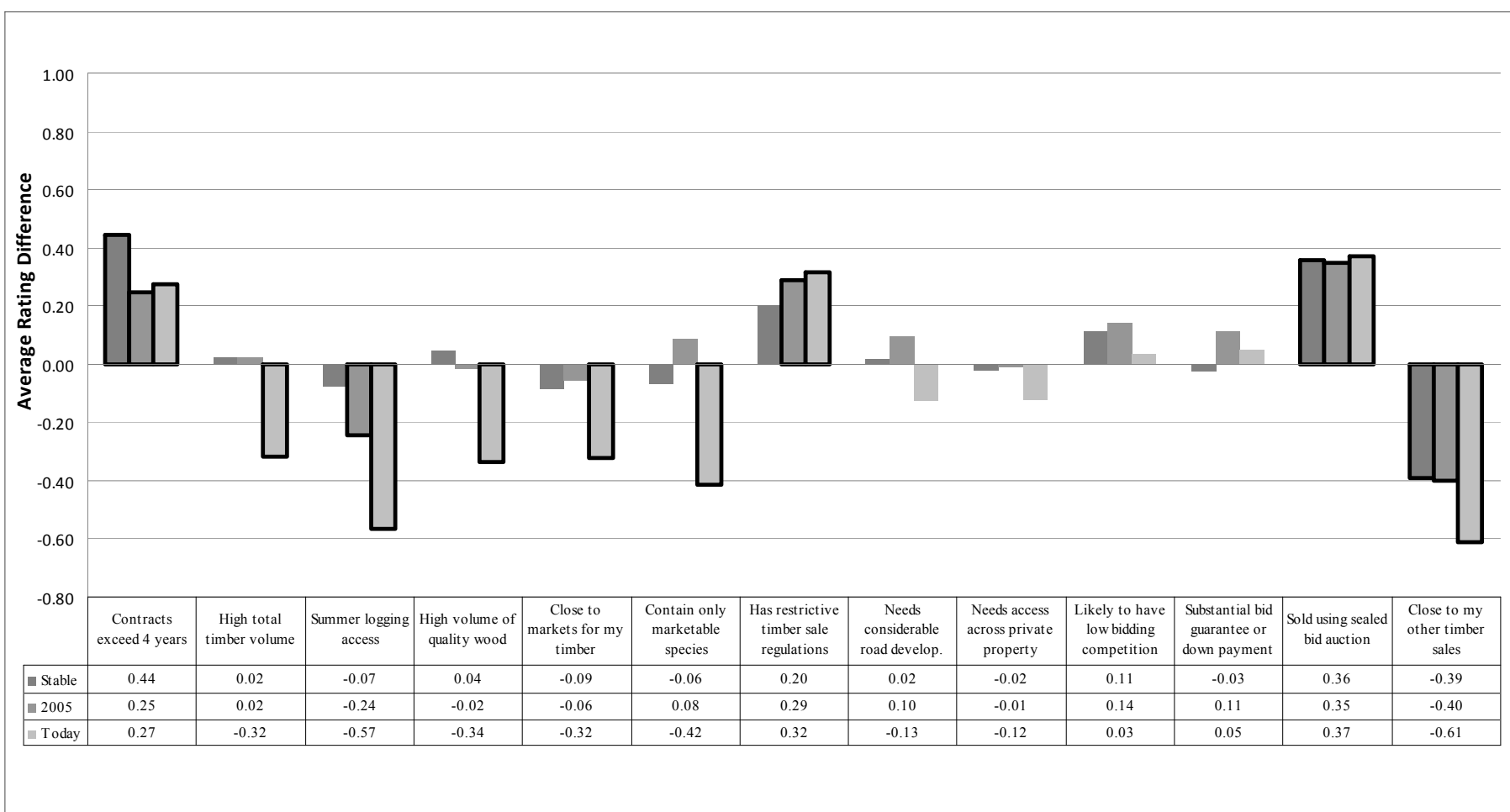


Figure 28. Differences between logger perceptions of and actual importance foresters place on DNR tract characteristics during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean stumpage purchaser scores minus mean DNR forester score based on a 5-point Likert scale where 1 = characteristic has very low importance; 5 = characteristic has very high importance. Significant differences ($p \leq 0.05$) in mean scores are shown as bordered bars.

6.5 Perceived Importance Loggers Place on Tract Characteristics

Loggers were asked to indicate the importance they place on 17 physical, contractual, and tract characteristics. Similarly, DNR foresters were asked to state how important each characteristic is to loggers when they bid on a DNR tract offered for sale. Of the 17 characteristics evaluated, 13 are those used in the preceding two sections (see Table 14), of which eight are most likely to positively impact the profitability of the tract and five are most likely to negatively impact the tract's profitability. In this section, four additional characteristics were added to the original 13 used in the previous two sections. These additional characteristics are: (1) the *logger's existing inventory of tracts*, (2) the *logger's expectation of future stumpage prices*, (3) the *logger's knowledge of the identity of the forester who appraised the tract*, and (4) the *logger's knowledge of the identity of the forester who would be responsible for supervising the harvest* once the tract was sold. These additional variables were hypothesized to influence willingness to pay (WTP) for stumpage based on the feedback obtained from the pre-survey logger focus group. Unlike the other 13 characteristics, it is not at all clear in which direction these four characteristics are likely to influence bidding behavior—their impact on WTP for stumpage is dependent on the conditions associated with each characteristic. With respect to item 1, a logger's WTP for stumpage will likely decrease if she/he has a high inventory of uncut tracts but will, on the other hand, likely increase if he/she has a low inventory of uncut tracts. With respect to item 2, a stumpage buyer who expects future stumpage prices to increase will likely be willing to pay more for standing timber than a buyer who expects future stumpage prices to remain level or decrease. With respect to items 3 and 4, participants in our logger focus group explained that their bidding behavior is heavily dependent upon the identity of the DNR forester with whom they must interact. Loggers come to know how individual foresters estimate volume. If the sale is a lump-sum payment, loggers' WTP is reduced if the forester is known to consistently over-estimate the volume of merchantable wood on a tract. If the forester is known to consistently under-estimate volume, on the other hand, WTP increases. Similarly, a forester who rigorously enforces tract regulations may lower a logger's WTP for tracts that will be supervised by that forester when compared to a forester who is more lenient in enforcing the terms and conditions of the sale.

Loggers and foresters were asked to provide their perspectives on how important these characteristics are in preparing bids for DNR tracts from the same three points in time reflecting a range of economic conditions. Survey respondents were instructed to evaluate the importance of these tract characteristics on a 5-point Likert scale, with a value of "1" assigned to those characteristics perceived to have very low importance and a value of "5" assigned to those characteristics perceived to have very high importance. The focus of this analysis is again on those tract characteristics that were perceived to change significantly ($p \leq 0.05$) over the three economic periods evaluated.

6.5.1 Logger Perspectives

Figure 29 identifies the mean ratings of importance loggers assigned to the 17 characteristics evaluated over three different economic periods. Over time, loggers placed significantly more ($p \leq 0.05$) importance on 12 of the 17 characteristics, meaning their weight was perceived to be greater today when compared to the past. The five characteristics whose importance did not change significantly over the three time periods were *having high total timber volume*, *needing to cross private land to access the timber*, *having low bidding competition*, *sold using a sealed bid auction format*, and *knowing the identity of the individual forester who will supervise the sale*. Of the 12 characteristics which showed greater importance over time, six (*contracts four years or more in length*, *summer logging access*, *high volume of quality wood*, *close to markets*,

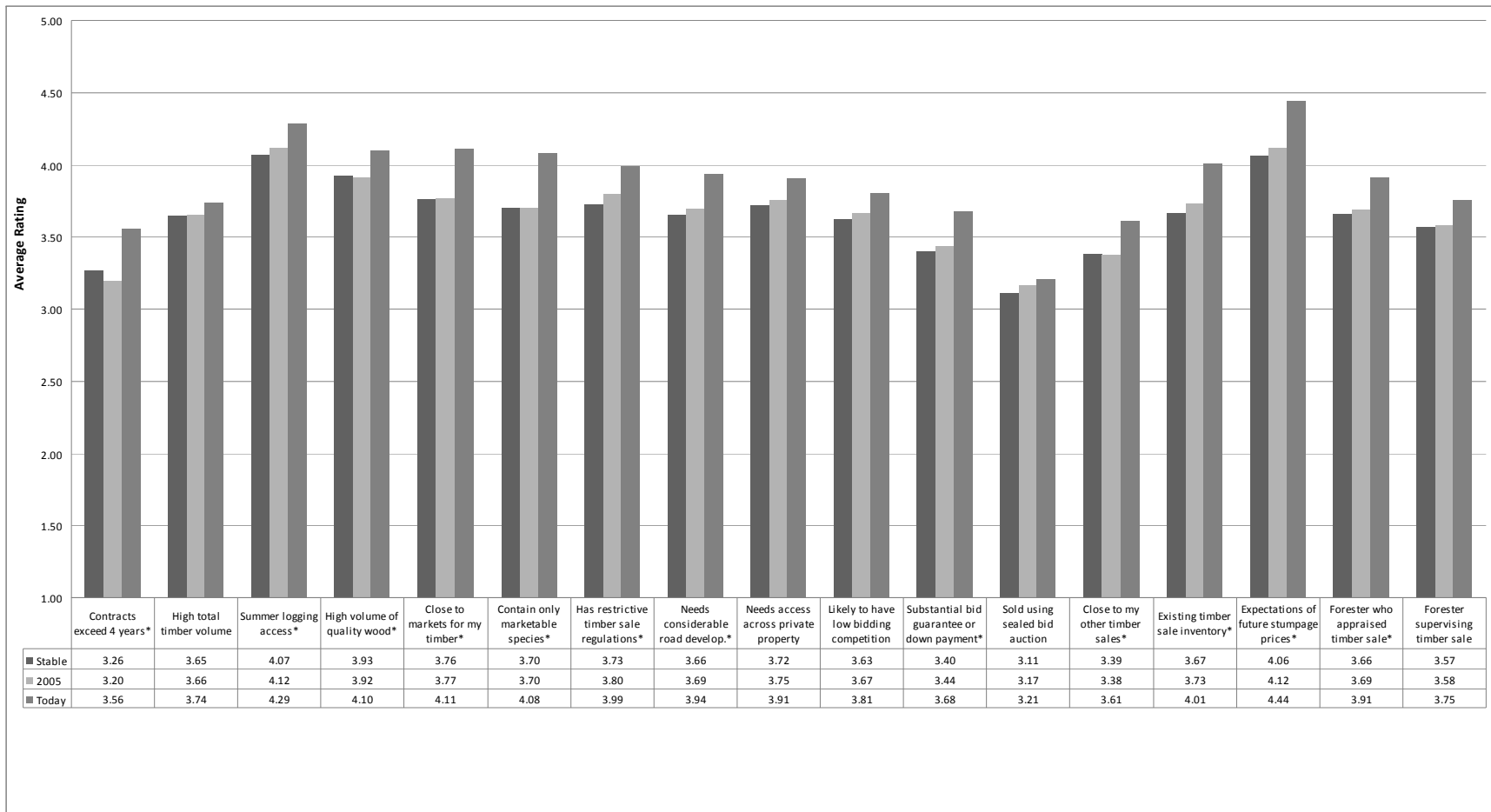


Figure 29. Importance placed on characteristics as perceived by loggers during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean scores based on a 5-point Likert scale where 1 = characteristic has very low importance; 5 = characteristic has very high importance. “*” indicates significant differences in one or more means at $p \leq 0.05$. (N = 295)

contains only marketable species, close to other tracts) have the potential to increase tract profitability, while three (*restrictive tract regulations, considerable road development needed, and requires a substantial bid guarantee/down payment*) could decrease tract profitability. The remaining three characteristics which showed an increasing importance over time were the logger's *existing timber sale inventory, expectation of future stumpage prices, and knowing who the forester was who appraised the tract*. An increased importance placed by loggers on *future stumpage price expectation* suggests these individuals consider market conditions and future price expectations to be more important than they have in the past.

6.5.2 DNR Forester Perspectives

DNR foresters were asked to indicate the importance they feel loggers place on the 17 characteristics, using the same 5-point Likert scale (Figure 30). Thirteen of the 17 tract characteristics exhibit significant changes ($p \leq 0.05$) over the same three economic periods. These are: *contains high total timber volume, provides summer logging access, contains high volume of quality wood, is close to product markets, contains only marketable species, has restrictive tract regulations, needs considerable road development, likely to have low bidding competition, requires substantial bid guarantee/down payment, is close to other tracts, the logger's existing tract inventory, expectation of future stumpage prices, and the forester who appraised the tract*. Eleven of these 13 characteristics were the same ones loggers placed increasing importance on over time. Only *low bidding competition* and *high total timber volume* were viewed to be more important factors by foresters than by loggers in influencing WTP for stumpage today than in the past.

6.5.3 Contrasting Logger and DNR Forester Perspectives

Figure 31 contrasts the perspectives of loggers and DNR foresters regarding the perceived versus actual importance these 17 tract characteristics have on a logger's WTP for DNR stumpage. Positive values indicate the importance loggers actually place on the characteristic is greater than the importance DNR foresters believe loggers place it. For eight of the 17 characteristics evaluated, the actual influence has on a logger's bid for stumpage exceeds what DNR foresters thought its influence would be. These characteristics include sales with: *contracts of length four years or more, high volume of quality wood, restrictive tract regulations, the need for access across private property, low bidding competition* and *stumpage sold using a sealed bid auction* and the influence of the *foresters who prepared and will supervise the tract*. With two exceptions, both in today's depressed market conditions, actual importance exceeded perceived importance across all three time periods. In contrast, DNR foresters overestimated the actual importance reported by the loggers with regard to the following four characteristics: *high total timber volume, only marketable species, close to other tracts, and existing tract inventory*. Of these, the *proximity of a DNR tract to the logger's existing tract portfolio* was perceived by DNR foresters to be more important to loggers in formulating stumpage bids than its actual importance across all three economic periods evaluated in the study. The other three characteristics (*contain high total timber volume, contain only marketable species, and the logger's existing inventory of tracts*) were significantly less important to loggers in determining their stumpage bids than what DNR foresters perceived their importance to be only in today's depressed economic climate.

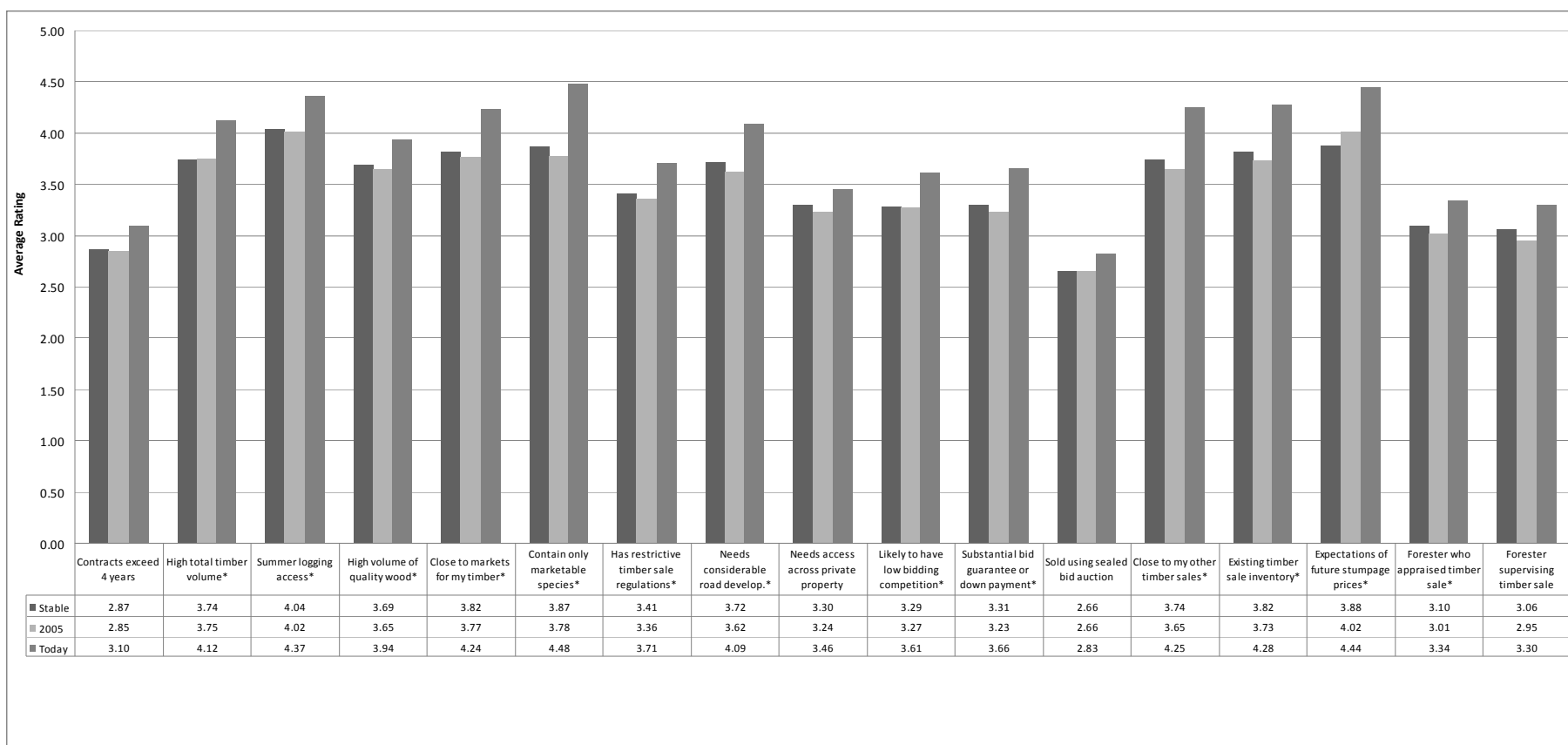


Figure 30. Importance loggers place on characteristics as perceived by DNR foresters during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean scores based on a 5-point Likert scale where 1 = characteristic has very low importance; 5 = characteristic has very high importance. “*” indicates significant differences in one or more means at $p \leq 0.05$. (N = 147)

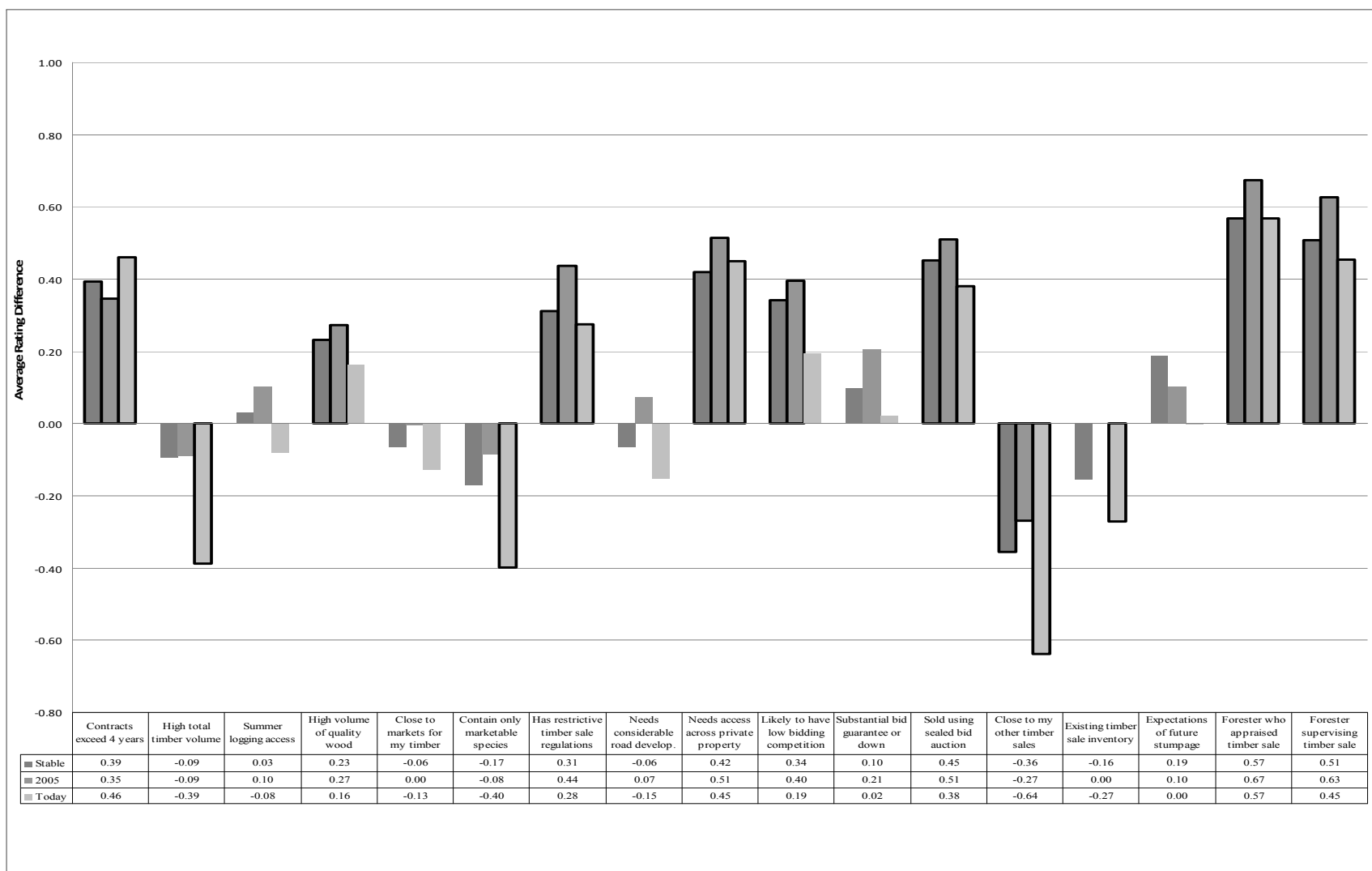


Figure 31. Differences between forester perceptions of and actual importance loggers place on characteristics when bidding on DNR stumpage during three time periods: 2009 (depressed stumpage prices), 2005 (historically high stumpage prices), and from 1995-2003 (characterized as having generally stable stumpage prices). Values are mean logger score minus mean DNR forester score based on a 5-point Likert scale where 1 = characteristic has very low importance; 5 = characteristic has very high importance. Significant differences ($p \leq 0.05$) in mean scores are shown as bordered bars.

6.6 Most Important Tract Characteristics in 2009

Following the evaluation of the 17 characteristics, loggers and DNR foresters were each asked to identify the three most important factors considered in 2009 when loggers formulate stumpage bids. A composite score was calculated for each characteristic that received a ranking, with increasing weight given as the importance increased (i.e., most important characteristic was more influential than second most important characteristic). When considering the three most important attributes based on the composite ranking, loggers felt summer logging access was the most important characteristic (Table 17). The second through fourth most important characteristics loggers considered in formulating bids for DNR stumpage (in declining order of importance) are: stands with high quality wood, stands containing only marketable tree species, and stands with high total timber volume.

Table 17. Importance of various characteristics loggers consider in 2009 when formulating bids for DNR stumpage, ordered according to composite ranking[†]. (n=360 most important characteristic, n=359 second most important characteristics, n=357 third most important characteristic).

Characteristic	Most important	Second most important	Third most important	Composite ranking
Have summer logging access	74	57	41	377
Contain suitable levels of high quality wood	58	40	31	285
Contain only species I have markets for	36	38	23	207
Contain high total timber volume	32	33	21	183
My expectations of future stumpage prices	32	13	20	142
Incorporate many restrictive tract regulations	22	21	24	132
Have contracts exceeding 4 years	24	17	18	124
Are close to the markets for my timber	15	20	30	115
My existing tract contract inventory	11	16	27	92
Are likely to have low bidding competition	13	18	15	90
Which forester appraised the tract	13	12	24	87
Which forester will supervise the tract	8	12	24	72
Require considerable road development	2	20	16	62
Require a substantial bid guarantee/down payment	10	11	8	60
Require me to secure access across private property	5	13	12	53
Are close to other tracts I've purchased	2	12	17	47
Are sold using a sealed bid auction format	3	6	6	27

[†] Calculated as follows: 3 points for Most Important; 2 points for Second Most Important; 1 point for Third Most Important.

DNR foresters were similarly asked to rank the three most important characteristics they felt loggers consider when preparing bids for DNR stumpage (Table 18). When ranked in order of importance using a weighted, composite score, foresters thought the four most important characteristics considered by loggers were (in order of declining importance) sales with only marketable tree species, contains high timber volume, has summer logging access, and contains a substantial volume of high quality wood. Foresters' perceptions of the most important characteristics aligned closely with the importance actually assigned by loggers—both cohorts

identified the same four most important characteristics. Figure 32 contrasts the views of loggers and DNR foresters regarding the most important factors influencing bids on DNR tracts.

Table 18. Perceived importance by DNR foresters of the most important tract characteristics loggers consider today when formulating bids for DNR stumpage, ordered according to composite ranking¹. (n=192 most important characteristic, n=192 second most important characteristics, n=190 third most important characteristic)

Characteristic	Most important	Second most important	Third most important	Composite ranking
Contain only species loggers have markets for	41	23	17	186
Contain high total timber volume	24	31	15	149
Have summer logging access	28	16	32	148
Contain a substantial volume of high quality wood	26	27	8	140
Their expectation of future stumpage prices	29	12	17	128
Their existing tract contract inventory	14	25	17	109
Are close to timber markets	13	24	13	100
Proximity to other tracts they own	6	10	23	61
Require considerable road development	2	12	12	42
Incorporate many restrictive tract regulations	2	5	6	22
Require a substantial bid guarantee/down payment	2	2	4	14
Are likely to have low bidding competition	2	1	2	10
Which forester appraised the tract	0	0	10	10
Require loggers to secure access across private property	1	1	3	8
Which forester will supervise the tract	0	0	5	5
Are sold using a sealed bid auction format	0	1	0	2
Have contracts exceeding 4 years	0	0	0	0

¹ Calculated as follows: 3 points for Most Important; 2 points for Second Most Important; 1 point for Third Most Important.

6.6.1 The Ideal Tract

Loggers were asked to describe the DNR tract that best meets their needs and foresters were asked to identify the characteristics of a DNR tract that they believe best meets the needs of loggers. For each group, respondents were asked to identify the size of the ideal tract (acres), the volume of wood offered for sale (cords or cord equivalents), the number of different product markets available within the tract, the length of the contract in years, the method used to auction the tract (i.e., sealed or oral bid), and the method of payment for the timber (i.e., consumer scale or lump sum).

The views of DNR foresters and loggers about what constitutes the ideal DNR tract offered for sale were relatively consistent for most of the characteristics evaluated (Table 19). Their views regarding the size and volume of an ideal DNR tract varied by only five acres and approximately 500 cords, with a slightly smaller tract size and higher volume preferred by loggers. Loggers saw the ideal tract as having four different product markets, whereas foresters believed loggers wanted tracts with six product markets. Both foresters and loggers viewed the

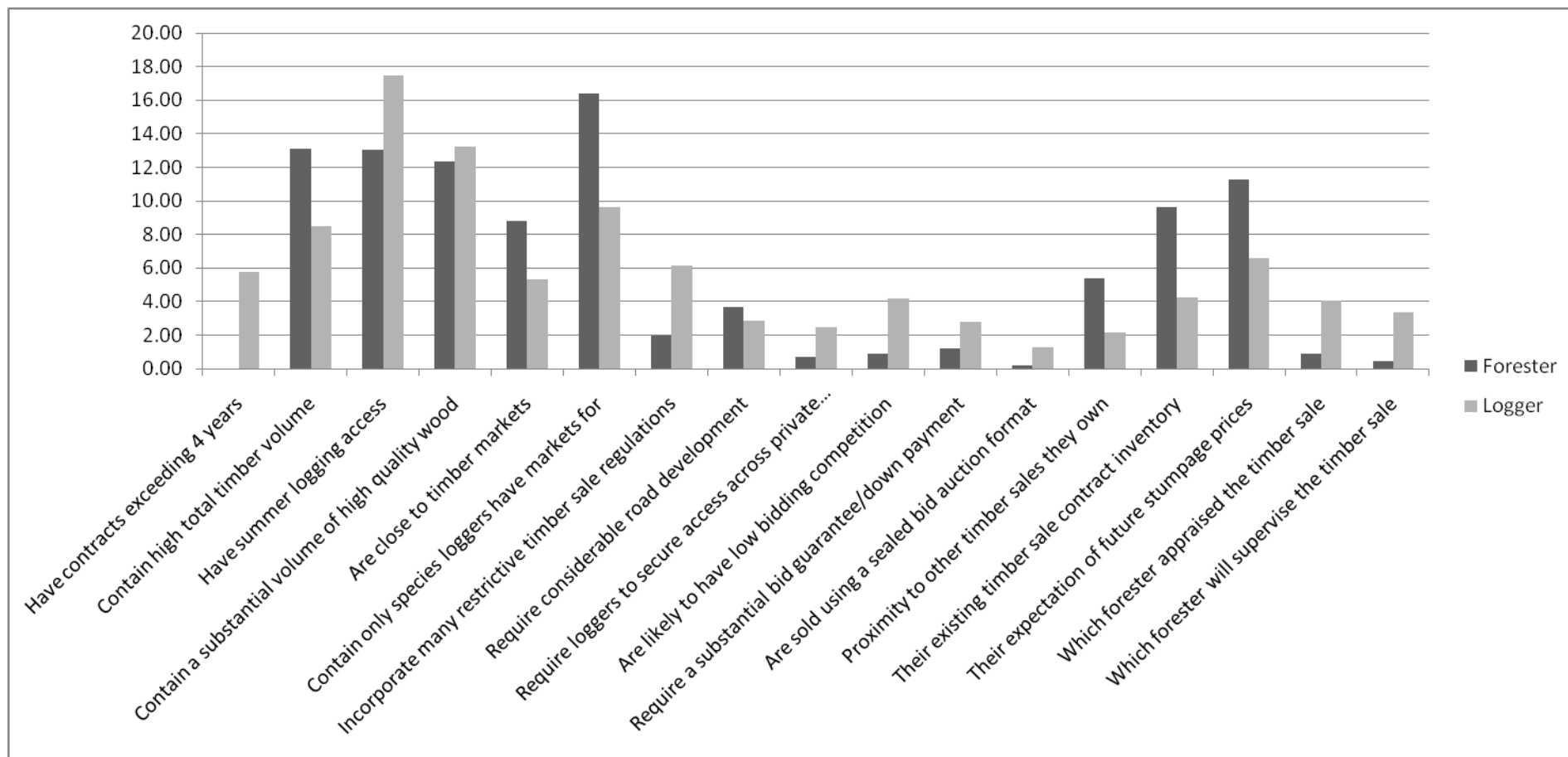


Figure 32. Frequency of characteristics considered most important when bidding on DNR tracts: loggers and DNR forester perspectives. Frequency is percent of total votes given by foresters and loggers calculated as follows: each factor received three points every time it was listed as Most Important, two points every time it was listed as Second Most Important, and one point every time it was listed as Third Most Important. Those points were then totaled and represented as a percentage of forester and logger votes, respectively. Vertical axis is “percent of responses.”

length of the ideal tract contract quite similarly, with only a 0.1 year difference in contract length between the two. Differences exist between loggers and foresters regarding the preferred method of selling DNR timber and paying for the stumpage purchased. Nearly 60% of loggers preferred sealed bid auctions while 52% of foresters thought loggers prefer oral auctions. The discrepancy between foresters and loggers was even larger when it comes to the method of payment for purchased stumpage. Seventy-two percent of the foresters felt that loggers preferred lump sum tracts when, in fact, only 47% of loggers preferred this method of payment.

Table 19. Ideal DNR tract characteristics as identified by loggers and DNR foresters. Values for sale size, volume, number of different product markets, and length of tract are means scores. Number of responses in ().

Characteristic	Logger	Forester
Size of the tract (acres)	87 (370)	91 (185)
Volume of the tract (cords)	4,185 (366)	3,618 (188)
Number of different product markets	4 (346)	6 (181)
Length of tract contract (years)	3.5 (374)	3.4 (190)
Preferred auction method	Sealed Bid Auction	Oral Auction
Percent	59 (366)	52 (189)
Method of paying for stumpage purchased	Consumer Scale	Lump Sale
Percent	53 (369)	72 (190)

6.6.2 Perspectives on Sealed Bid Timber Auctions

Loggers and DNR foresters were asked a series of questions regarding the use of sealed bid as a means of purchasing stumpage. Note that not all DNR stumpage is offered for sale using sealed bid auction format; therefore a large amount of the “Don’t Know” responses may be attributed to respondents (both loggers and foresters) in areas that do not use this auction method. In sum, loggers are evenly split with regard to whether oral auctions result in higher prices paid for stumpage (39% agree or strongly agree while 38% disagree or strongly disagree) (Figure 33). The majority of loggers felt that purchasing stumpage sold using a sealed bid format makes it harder for them to achieve their ideal inventory of tracts as compared to stumpage sold on an oral auction (52% agree or strongly agree with this statement; 36% disagree or strongly disagree). Other aspects of sealed bid auctions for stumpage that generated a plurality of agreement among loggers were that they created less bidding frenzy than oral auctions and that sealed bid auctions resulted in higher prices paid than would have been the case with an oral auction. Only 22% of the responding loggers said that sealed bid auctions decrease competition for stumpage when compared to oral auction sales; nearly two-thirds of the respondents disagreed with this statement.

When compared to stumpage sold using an oral auction format, the majority of foresters felt that sealed bid auctions make it more difficult for loggers to manage their inventory of tracts, generate less bidding frenzy, require loggers to spend more time preparing a bid for the stumpage, and result in loggers paying more for stumpage than if it had been sold through an oral auction (Figure 34). Only 23% of the foresters felt sealed bid auctions decreased bidding competition.

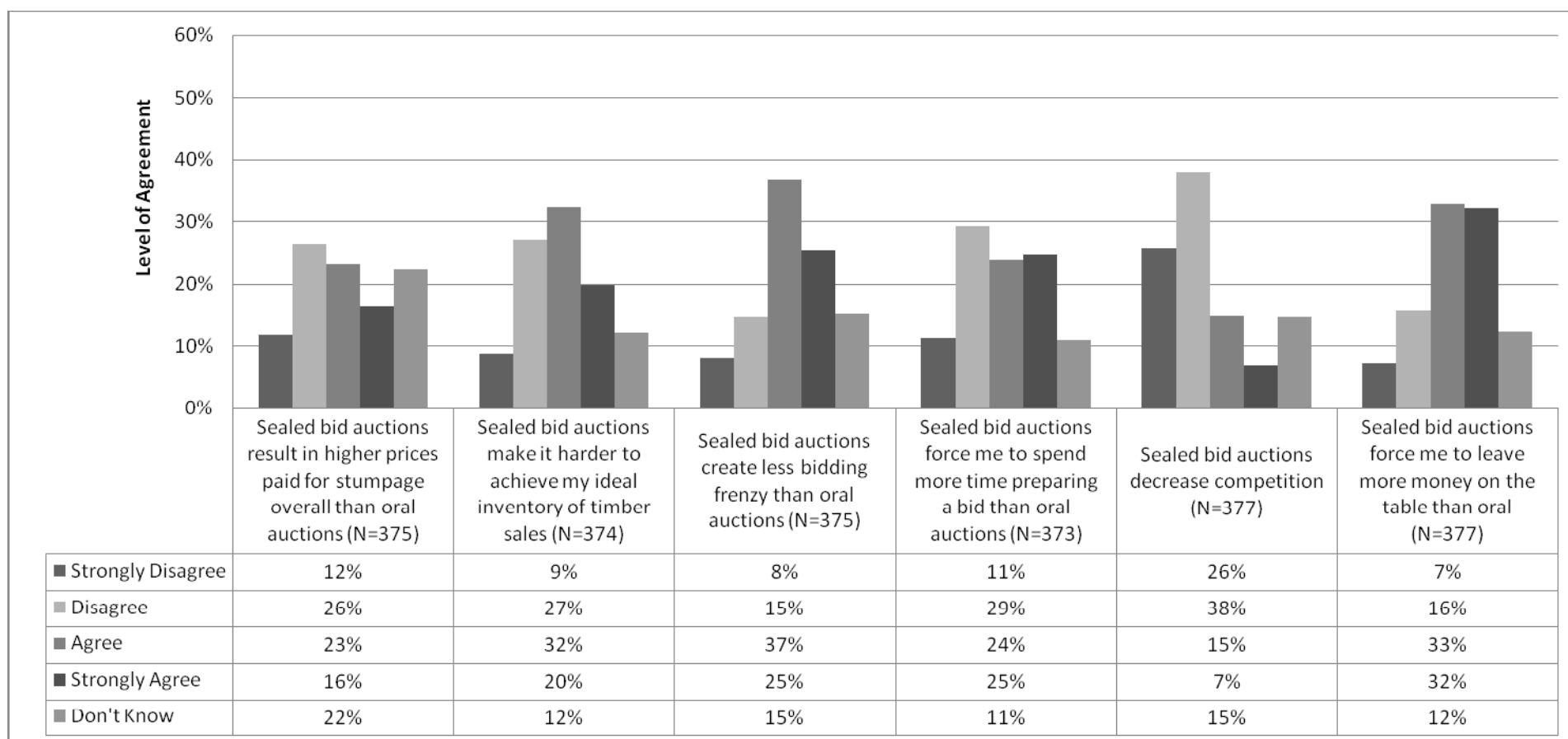


Figure 33. Logger perspectives on statements about sealed bid auctions. Results are presented as a percent of total logger responses.

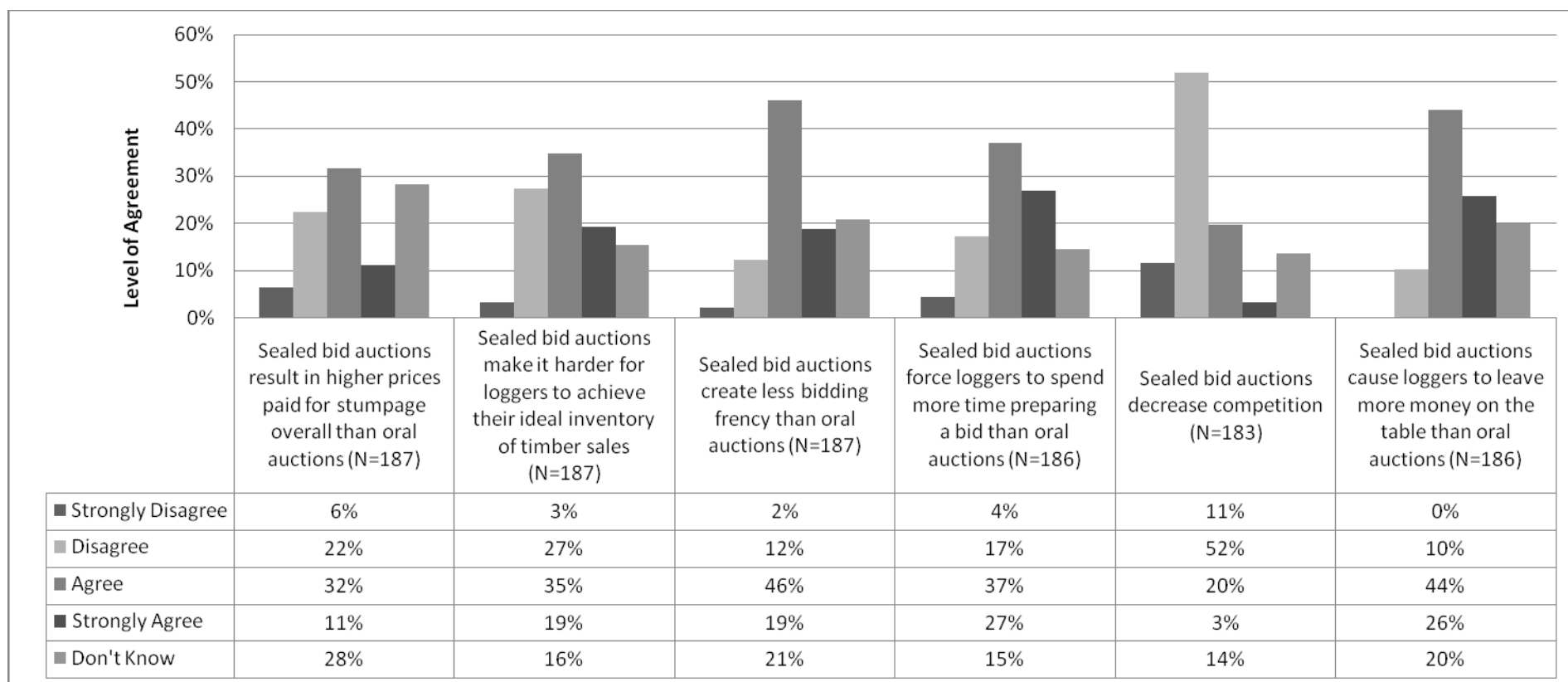


Figure 34. DNR forester perspectives on statements about sealed bid auctions. Results are presented as a percent of total forester responses.

Loggers and DNR foresters held similar views about sealed bid auctions as a method for selling stumpage (Table 20). For nearly all qualities of sealed bid auctions evaluated, the level of agreement between the two groups was within five percent. The one exception was their perspectives about the amount of preparation time sealed bid auctions require of loggers relative to the time needed to prepare bids for stumpage sold at oral auction. Nearly two-thirds of foresters believe sealed bid auctions require more preparation time from loggers than oral auction stumpage sales. Yet, slightly less than a majority of loggers (49%) felt that this was the case.

Table 20. Percent of loggers and DNR foresters who agreed or strongly agreed with statements about sealed bid auctions. Number of responses in ().

Statement	Percent that strongly agree or agree	
	Loggers	Foresters
Sealed bid auctions result in higher prices paid for stumpage overall than oral auctions	39 (375)	43 (187)
Sealed bid auctions make it harder to achieve my ideal inventory of tracts	52 (374)	54 (186)
Sealed bid auctions create less bidding frenzy than oral auctions	62 (375)	65 (186)
Sealed bid auctions force me to spend more time preparing a bid than oral auctions	49 (373)	64 (187)
Sealed bid auctions decrease competition	22 (377)	23 (186)
Sealed bid auctions force me to leave more money on the table than oral auctions (larger gap between winning bid and second highest bid)	65 (377)	70 (186)

6.6.3 Method of Paying for Purchased Stumpage

Loggers and DNR foresters were also asked to provide their perspective about the use of consumer scale and lump sum methods for paying for purchased stumpage. A lump sum tract requires the logger to pay a fixed amount for the stumpage purchased, based on the appraised timber value and purchase price per unit value. In contrast, a tract sold on a consumer scale basis charges the logger only for the timber actually harvested and scaled by the consuming mill(s) or the supervising forester. Loggers were asked to evaluate how consumer scaling affects bid preparation time, financial risk, and bidding competition. More than three-fourths of the responding loggers felt lump sum methods require more bid preparation time than stumpage sold on a consumer scale basis (Figure 35). A slightly smaller majority (72%) indicated lump sum methods pose greater financial risk to them as compared to stumpage sold on consumer scale. Yet only 32% agreed with the statement that lump sum methods are less competitive than consumer scale methods.

Nearly two-thirds of responding DNR foresters felt lump sum methods require more effort to prepare a tract for auction (65% felt this way). The majority (55%) of foresters also felt that lump sum methods create more financial risk to their agency than do consumer scale methods. A nearly equal percent (56%) agreed that lump sum methods are less expensive to administer than consumer scale methods. Only one in five responding foresters stated that lump sum methods are less competitive than consumer scales, and only 16% agreed with the statement that lump sum methods are less likely to result in achieving stand management objectives.

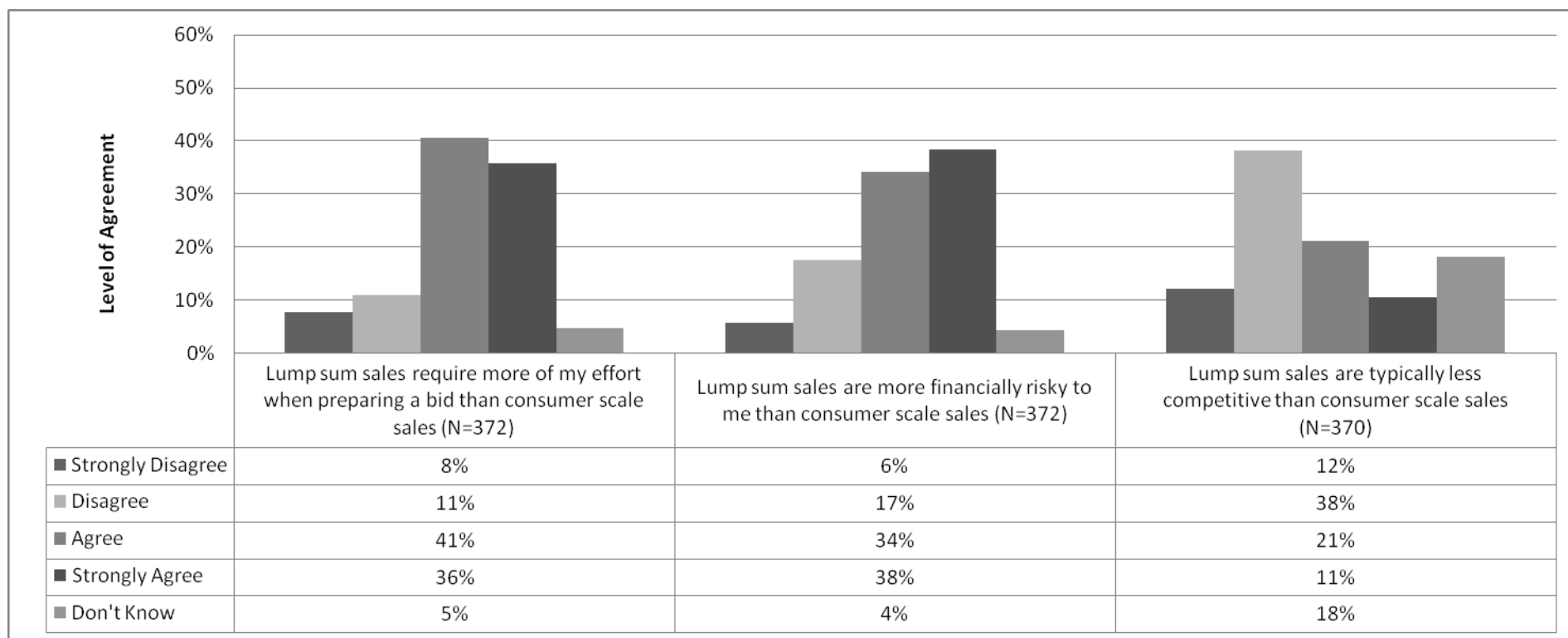


Figure 35. Logger perspectives on statements about lump sum methods. Results are presented as a percent of total logger responses.

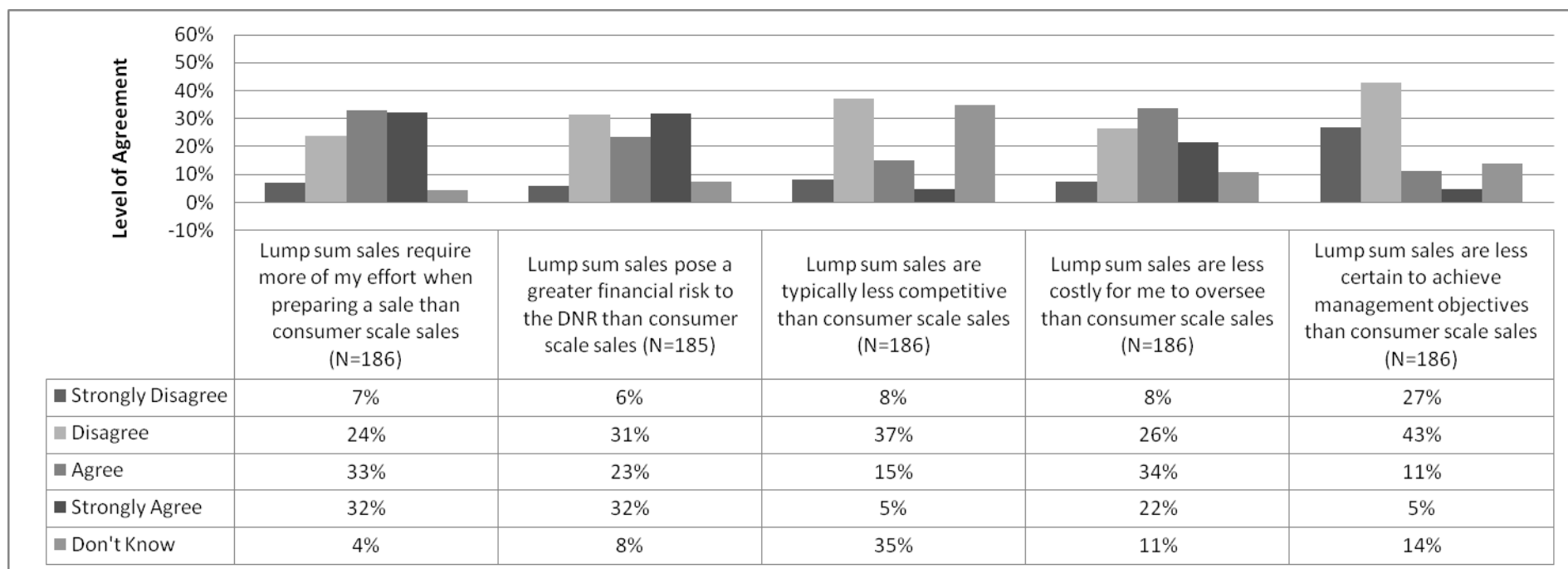


Figure 36. DNR forester perspectives on statements about lump sum tracts. Results are presented as a percent of total forester responses.

Table 21 presents the views of loggers and foresters with respect to three comparisons of lump sum to consumer scale methods: required effort, financial risk, and level of bidding competition. For all three areas evaluated, loggers were in greater unanimity in their views. Seventy-seven percent of the responding loggers agreed that lump sum methods require more of their effort than consumer scale methods, while only 65% of the foresters felt this way. A substantial majority of loggers (72%) felt lump sum methods pose a greater financial risk to them. In contrast, just over half (55%) of the DNR foresters agreed that lump sum methods create more financial risk to their agency than do consumer scale methods. Few loggers and foresters agreed that tracts paid for on a lump sum basis are less competitive than consumer scale tracts, with 32% and 20% of loggers and foresters feeling this way, respectively.

Table 21. Percent of loggers and foresters who agreed or strongly agreed with statements about lump sum methods.

Statement	Percent that strongly agree or agree	
	Loggers	Foresters
Lump sum methods require more of my effort than consumer scale methods	77	65
Lump sum methods are more financially risky to me (my agency) than consumer scale methods	72	55
Lump sum methods are typically less competitive than consumer scale methods	32	20

6.7 Summary and Conclusions

Data collected from the mail surveys to buyers of DNR stumpage and DNR foresters in the Lake States provides insight on how each group perceives changes in the importance of timber tract attributes (e.g., tract contract provisions, tract characteristics, and administrative procedures) as economic conditions change.

Perceived changes in the frequency of DNR timber tract characteristics

Loggers felt several tract characteristics that have the potential to increase tract profitability were becoming less frequently associated with DNR tracts offered for sale in the current economically-challenging market conditions. They also felt two tract characteristics (more timber sale regulations and requiring a substantial bid guarantee or down payment) were more commonly associated with DNR tracts offered for sale in today's difficult economic climate as compared to the other economic periods evaluated. Like the loggers, DNR foresters also felt several tract characteristics that improve profitability decreased in frequency over time. Foresters also felt that the frequency of DNR tracts offered for sale with low bidding competition is significantly higher in today's depressed timber markets than during stable and robust stumpage market conditions—a condition that could improve the profitability of a tract by reducing the cost of stumpage.

Perceived changes in the importance DNR foresters place on tract characteristics

Loggers felt DNR foresters placed less emphasis today on tracts with summer logging access and containing a high volume of quality wood as compared to the past. Timber tracts containing restrictive regulations were perceived by loggers to significantly increase in importance among DNR foresters over time. Similarly, DNR foresters believed tracts with restrictive regulations have increased in importance over time. Foresters also thought the importance they place on tracts that are close to product markets and those that contain only marketable species increased over time.

Perceived changes in importance loggers place on tract characteristics

Only five of the 17 tract characteristics were viewed by loggers not to change in importance over time. In contrast, DNR foresters felt 13 of the 17 tract characteristics increased significantly over time. Of these, 11 were the same ones loggers placed increasing importance on over time. The two tract characteristics foresters (but not loggers) felt increased in importance over time when it came to bidding on DNR stumpage were low bidding competition and high total timber volume. The different proportion of logger and forester responses from each state (and state-specific timber sale policies) likely accounts for some of these differences.

Most important timber tract characteristics

Loggers felt summer logging access was the most important characteristic of a tract auctioned for sale by the DNR. Other important characteristics include stands with high quality wood, stands that only contain marketable tree species, stands with high total timber volume, and expectations about future stumpage prices. DNR foresters' perceptions of the most important characteristics aligned closely with the importance actually assigned by loggers—both groups identified the same five most important characteristics.

The ideal timber tract

The views of DNR foresters and loggers about what constitutes the ideal tract of timber offered for sale by the DNR were relatively consistent. This tract is approximately 90 acres, contains roughly 4,000 cords of wood, has between 4 to 6 product markets, and is sold on a 3.5 year contract. Nearly 60% of loggers preferred sealed bid auctions while 52% of foresters thought loggers prefer oral auctions. Seventy-two percent of the foresters felt that loggers preferred lump sum tracts, while only 47% of loggers preferred this method of payment.

Perspectives on sealed bid timber auctions

Loggers are uncertain whether oral auctions result in higher prices paid for stumpage. Most felt that purchasing stumpage sold using a sealed bid format makes it harder for them to achieve their ideal inventory of tracts as compared to stumpage sold on an oral auction. Yet they believed sealed bid auctions create less bidding frenzy than oral auctions. Only 22% of the responding loggers said that sealed bid auctions decrease competition for stumpage when compared to oral auction sales.

The majority of foresters felt that sealed bid auctions make it more difficult for loggers to manage their inventory of tracts, generate less bidding frenzy, require loggers to spend more time preparing a bid for the stumpage, and result in loggers paying more for stumpage than if it had been sold through an oral auction. Only 23% of the foresters felt sealed bid auctions decreased bidding competition. Nearly two-thirds of foresters believe sealed bid auctions require more preparation time from loggers than oral auction stumpage sales. Yet, slightly less than a majority of loggers (49%) felt this was the case.

Method of paying for purchased stumpage

Over three-fourths of the loggers felt lump sum methods require more bid preparation time than stumpage sold on a consumer scale basis, and most felt lump sum sale methods pose greater financial risk to them as compared to stumpage sold on consumer scale. Only 32% of the loggers

agreed with the statement that lump sum methods are less competitive than consumer scale methods.

Nearly two-thirds of responding DNR foresters felt lump sum methods require more effort to prepare a tract for auction. A majority also felt that lump sum methods create more financial risk to their agency than do consumer scale methods. Foresters were uncertain whether lump sum methods are less expensive to administer than consumer scale methods. Only one in five stated that lump sum methods are less competitive than consumer scales, and only 16% agreed with the statement that lump sum methods are less likely to result in achieving stand management objectives.

7. Study Conclusions and Recommendations

Using multiple methods, the study generated considerable data on state timber sale programs and stumpage prices. This includes information on the design and administration of state timber sale programs in the US, the perceptions of Lake States loggers and DNR foresters regarding the influence of timber sale tract characteristics on DNR stumpage prices, and how timber sale policies and administrative procedures impact the price paid for a tract of timber sold by the MN DNR. When considered in aggregate, the data suggest the following major conclusions and recommendations for further study.

7.1. State Timber Sale Program Administration

7.1.1 Increasing Program Effectiveness

State timber sale programs act within their state's legal and administrative framework, which includes constitutional articles, statutory codes, and administrative rules. This study revealed three areas that, if addressed, can enhance state timber sale program effectiveness: (1) clear identification and prioritization of timber sale program goals; (2) adequate flexibility to adjust methods of sale; and 3) protected forest management accounts.

7.1.1.1 Clear identification and prioritization of timber sale program goals

State timber sale programs typically receive direction from a variety of sources, including state statutes, administrative codes, and agency guidelines or manuals. On average, a state timber sale program is guided by four explicit goals. Identifying the sources that guide state forest management and clarifying the language used to prioritize timber sale program goals may help improve program operations. State timber sale program supervisors also believe their programs are responsible for achieving many programmatic goals which are not explicitly identified in state statute. For example, approximately one in four states have revenue from timber sales as an explicit program goal. The perceived responsibility to meet a large number of program goals, both stated and implied, makes it difficult for program administrators to identify clear priorities in instances when goals are mutually exclusive. Also, ill-defined program goals make it difficult to establish criteria by which to evaluate state timber sale program performance.

7.1.1.2. Adequate flexibility to adjust methods of sale

States should avoid mandating on-the-ground timber sale procedures that potentially hinder a program's ability to achieve timber sale program goals. Whenever possible, timber sale administrators (e.g., foresters, timber sale supervisors) should be given ample discretion to determine the sale procedures that best fit individual tract conditions. For example, instead of requiring all or nearly all tracts be offered at auctions, states may be able to increase revenue if timber sale administrators are allowed to negotiate sale prices with potential purchasers in areas with low competition for stumpage. Also, in situations when emergency stand management is needed (e.g., removal of pests or pathogens, cleanup following blowdown), negotiating sales with potential purchasers allows timber sale administrators to bypass the time-consuming procedures needed to set up an auction and may result in quicker harvests.

7.1.1.3. Protected forest management accounts

Whenever possible, states should create protected forest management accounts that dedicate a portion of receipts from timber sale revenues for internal program operations. Several state timber sale programs, including the MN DNR, already have protected forest management accounts, but many states have forest management accounts that are subject to unexpected reallocation to nonforestry programs. Other state programs receive no revenue from their timber sales—100% of timber sale revenues go directly into the state's General Fund. Programs that are not guaranteed a portion of the revenue generated from setting up and administering a timber sale have little incentive to manage the portfolio of state forest lands in a manner that maximizes financial returns from timber management. A well-established relationship between timber sale activities and program funding may encourage more efficient timber sale operations and generate greater financial returns to the state.

7.1.2. Reducing Program Costs

State timber sale program supervisors identified two opportunities to reduce program administrative costs: (1) simplifying the timber sale contract language and approval process; and (2) upgrading computer software and technology.

Timber sale contracts are becoming increasingly complex. Several states have modified contractual timber sale language to include more detailed language about liability and insurance coverage, log grading specifications, safety and best management practice requirements, logger training requirements, and penalties for contract violations. Language associated with best management practice requirements sometimes lacks consistency across contracts, making it difficult for buyers to understand meaning and intent. While the additional language may be in response to certification requirements or in response to legal reviews, any extra complexity may not be fully understood by prospective timber buyers.

Additionally, the process needed to approve a state timber sale can be long and arduous, utilizing a lot of personnel time. As state timber sale programs continue to evolve, policymakers and program administrators should be aware of the added costs associated with meeting these new legal obligations, and look for ways to simplify the timber sale contract writing and approval process. One example of the latter is a timber sale management system that contains pull down menus that allow an administrator to select canned contract language which is consistent across all timber sales.

Technological upgrades are another opportunity to enhance administrative efficiencies, particularly in states with large timber sale programs. Many timber sale programs utilize outdated technology or multiple databases that are not effectively integrated. States that recently upgraded their computer systems reported lower administrative costs.

7.1.3. Increasing Communication Among State Timber Sale Program Administrators

State timber sale program administrators have a tremendous opportunity to improve operations through increased program-to-program communication with their peers. Each program has developed almost entirely on its own—utilizing policies and procedures that reflect that state’s unique physical, political, and economic conditions. State timber sale program administrators have a wealth of experience with and knowledge about characteristics of effective state timber sale program design and administration. Unfortunately, state timber sale program administrators rarely communicate with their peers outside their state or region. The state timber sale program administrators who participated in our focus groups felt increased communication between state timber sale program administrators could improve program decision-making. The creation of a formal association of state timber sale program administrators, such as a national organization that provides a venue (e.g., annual conference) or platform (e.g., a website) by which to share information, could help improve future state timber sale program design and administration.

7.2. State Timber Sale Design and Administration and Stumpage Prices

When considering the relative merits of the following timber sale design characteristics, state policy-makers should be aware of one important study finding: a “typical” state timber sale program does not exist. There is a high degree of diversity between the physical, legal, and economic conditions under which state timber sale programs operate—making it nearly impossible to recommend changes to state timber sale design and administration that would improve effectiveness and efficiency in all programs. A “one size fits all” guide to state timber sale design does not exist. Since this study began as a response to concerns about the MN DNR timber sale program, study conclusions focus on Minnesota’s stumpage market and implications for MN DNR timber sale program design and administration. Individual states should carefully consider the recommendations provided in this study, but continue to tailor their timber sale programs to meet the needs and conditions in their respective agencies.

7.2.1. Impact of Timber Sale Design Characteristics on Stumpage Prices

The following describes the impact various tract characteristics have on MN DNR stumpage prices.

7.2.1.1. Seasonal harvest restrictions

While the use of seasonal operating restrictions may effectively protect the environmental quality of the site, these restrictions adversely affect stumpage prices and gross timber sale revenue. Offering a high percentage of tracts for sale with frozen ground conditions as a requirement reduces the number of tracts available for purchase at other times of the year, often increasing competition for tracts that can be harvested year-round while making it difficult for buyers to maintain an adequate stumpage inventory throughout a range of harvest conditions. The MN DNR should continue to utilize seasonal operating restrictions on harvest sites vulnerable to environmental degradation, but should be judicious in their use in order to avoid sacrificing

financial returns. Opportunities may exist to increase financial returns and maintain current levels of environmental quality by offering more sales that allow harvest operations during dry periods.

7.2.1.2. Season of sale

Holding everything else constant, MN DNR tracts offered for sale during the fourth quarter (October-December) receive the lowest prices and tracts offered in the second quarter (April-June) receive the highest prices. The reason(s) for this price differential is largely unknown, but other studies suggest the difference could be the result of different levels of competition in the two seasons (Carter and Newman 1998; Leefers and Potter-Witter 2006). Until the specific reasons for this phenomena become known, timber sale program administrators should be cautious of using this finding to justify a transition towards offering more tracts of timber in the second quarter. The MN DNR may be able to increase annual timber sale revenue by offering a greater portion of their timber in the second quarter. However, the change may adversely affect the MN DNR's stumpage market as many purchasers would be forced to bid on a large volume of state stumpage in one period. Since businesses often adjust to constantly changing delivered wood and end-product markets, many of them depend on the ability to secure state stumpage at MN DNR auctions throughout the year. Reducing the stumpage volume offered during certain times of the year could make it difficult for stumpage purchasers to plan their inventory of stumpage contracts and potentially reduce the number of bidders at MN DNR timber auctions.

7.2.1.3. Size of tract offered for sale

Results from this study indicate that the size of a tract, expressed as total merchantable timber volume, is an important timber sale design characteristic. Prices paid for medium sized tracts (500-1999 cordE) are significantly lower than large tracts (2000+ cordE) and significantly higher than small tracts (less than 500 cordE). Timber sale administrators must weigh the potential financial advantages of larger timber tracts against other forest management considerations (e.g., vegetative management, wildlife habitat) and a desire to maintain a diverse logging capacity that are able to operate across a broad range of tract volumes offered for sale. When possible, the MN DNR should avoid offering timber tracts containing less than 500 cordEs and look for opportunities to offer large 2000+ cordE tracts. These changes may not be possible when other management goals require the use of silvicultural prescriptions with low volume removals, such as thinning or where sale blocks are small. Also, silviculture prescriptions with low volume removals must be conducted by loggers who have the necessary skill and equipment—loggers that may not exist in future years if too few small tracts are offered for sale. Finally, caution should be exercised when applying certain sale requirements to small tracts of timber (e.g., restricting the season of operation, requiring extensive road building), as the added costs of these restrictions can determine whether harvesting the tract is financially viable to the operator.

7.2.2. Impact of Timber Sale Administrative Characteristics on Stumpage Prices

7.2.2.1. Contract length

In 2005, the MN DNR used 5-year contracts to sell much of its timber. A review of state timber sale programs across the country revealed that other states typically give two years or less to harvest timber; 3 to 5 year timber sale contracts are extremely rare.

The results from the hedonic analysis and paired bidding experiment revealed new and interesting information about stumpage bidders' willingness to pay for longer timber contracts. The value of longer contracts to stumpage purchasers is based almost entirely on prevailing market conditions and expectations about future prices. This finding is important for two reasons. First, shorter contracts will help reduce price speculation. Second, utilizing 2-year contracts gives most stumpage purchasers adequate flexibility needed to manage their inventory of stumpage contracts. Prior to this study, one potential concern associated with shorter contracts was that they make it more difficult for stumpage purchasers to manage their inventory of stumpage contracts, many of which may be subject to seasonal harvest restrictions. Poor weather conditions or severe market downturns could make it difficult to harvest the wood within a shorter timeframe. However, study results show that bidders were willing to pay very little for the added operational flexibility associated with contracts longer than two years under the market conditions that existed when the study was conducted.

Shorter contracts may also improve timber sale program effectiveness because they help the state accomplish silvicultural work in a timely manner by encouraging quicker timber harvests. Study results indicate 2-year contracts reduced average expected harvest dates by approximately 6 to 8 months compared to 5-year contracts. This difference may underestimate the impact of shorter contracts on harvest dates because the data were collected during a period when most stumpage bidders did not expect future price increases so there was little financial incentive for purchasers to hold a timber sale for more than two years.

The MN DNR should strongly consider using shorter (i.e., 2-year) timber sale contracts in place of 5-year contracts. Two-year contracts can be used to reduce price speculation and encourage quicker timber harvests without substantially limiting the flexibility stumpage purchasers' need to manage their inventory of stumpage contracts.

7.2.2.2. Reserve prices

In Minnesota, reserve price has a significant impact on bidding behavior and MN DNR stumpage prices. This finding has important implications for public timber sale design and administration. Public timber sale programs often spend considerable staff resources estimating fair market value for stumpage and developing reserve prices. Study findings suggest that efforts to establish reserve prices are well-justified. With this in mind, the MN DNR should continue to set reserve prices if they wish to maximize gross timber sale revenue and, where possible, look for ways to refine the process used to establish reserve prices in a way that helps them achieve their forest management goals (e.g., financial returns from timber management investment, silvicultural work).

7.2.2.3. Auction methods

First-price sealed bids are the dominant auction method used in state timber sale programs around the country; ascending oral bid auctions are rarely utilized. State timber sale supervisors strongly prefer first-price sealed bid auctions to ascending oral bid auctions. They believe first-price sealed bid auctions generate higher prices and greater revenue for the state. In addition, many supervisors believe sealed bid methods reduce the likelihood of exorbitant and emotional bidding behavior that can exist at ascending oral bid auctions. Much of the timber auction literature supports supervisors' opinions: first-price sealed bid auctions typically elicit higher

prices, especially in areas of low competition (Johnson 1979; Weiner 1979; Haynes 1980; Hansen 1986). They are also found to eliminate preclusive bidding and reduce the likelihood of collusion (Brannman 1991).

The paired bidding experiment revealed one potential drawback associated with first-price sealed bid auctions: bid shading. Many bidders reduced, or shaded, their half reserve price bids below true maximum willingness to pay in an attempt to secure the tract for less than their true willingness to pay. Bid shading is a common strategy in first-price sealed bid auctions, particularly when bidders do not believe they are operating in a highly competitive market (Klemperer 1999). In some cases, firms with the highest willingness to pay for the timber shade their bid downward so much they lose the tract to a firm that attached less value to the timber. This type of behavior is problematic from the standpoint of economic efficiency as a tract should be awarded to the individual or firm who values it the highest.

The MN DNR may be able to increase timber sale revenue and reduce the likelihood of exorbitant bidding by moving towards more first-price sealed bid auctions. However, they should be aware of potential economic inefficiencies associated with bid shading. If bid shading is a significant concern, they should consider using an alternate auction method, such as a second-price sealed bid auction (see Section 6.5.3). Also, when using a sealed bid method, the MN DNR should attempt to offer tracts of timber at auctions throughout the year and avoid conducting a small number of auctions where a large number of tracts are offered for sale. A small number of auctions makes it difficult for purchasers to secure their optimal number of timber tracts.

7.2.2.4. Small business opportunities

State timber sale programs across the country use a variety of tools to increase timber availability for small businesses, include negotiating small sales with local contractors, lowering capital investment requirements (e.g., down payments), or offering small tracts of timber with smaller cutting blocks. However, no other states have a formal policy that resembles Minnesota's intermediate timber sale process. Minnesota appears to be the only state timber sale program that uses formal procedures to prevent large companies from bidding at timber auctions in an effort to increase timber availability for small businesses. The unique nature of the intermediate timber sale procedure raises interesting questions about the degree to which it helps achieve state timber sale program goals.

Study results reveal no significant difference between the price paid for timber at intermediate and regular auctions. This finding may be interpreted in different ways. First, it may show that Minnesota has a strong and healthy small business community. More specifically, small businesses may be so influential in the bidding process that stumpage prices are unaffected when large firms are removed from the bidding process. Even more, the intermediate sales process may help maintain a healthy level of competition by reducing the likelihood of preclusive bidding. Preclusive bidding occurs when one bidder makes extremely high stumpage bids to discourage other bidders from participating in subsequent auctions, thereby reducing the level of competition and driving future prices downward. Small businesses are more likely to be adversely affected by the presence of preclusive bidding because they rarely have the ability to secure the necessary capital to compete with the extremely high preclusive bids. Preclusive

bidding also makes it difficult for states to generate adequate revenue from timber sales because future competition for stumpage is reduced.

An alternative explanation for this finding that the intermediate sale process has no impact on stumpage bidding or the small business community could be because large firms have informal relationships with smaller logging businesses who are qualified to purchase stumpage at intermediate auctions. Many of the small businesses that purchase MN DNR stumpage are independent, family-owned logging operations that purchase the stumpage, harvest the timber, and sell the harvested forest products to large wood processing mills (i.e., large firms). Mills may solicit loggers to purchase stumpage at intermediate auctions and, in return, agree to take delivery of the harvested forest products. In other words, large firms could simply use logging businesses with 20 or fewer employees to purchase the stumpage for them. If this behavior occurs, the intermediate sale process may not effectively enhance small business opportunities.

7.3. Logger and Forester Perceptions of Timber Tract Characteristics and Stumpage Bids

Results from a survey of stumpage purchasers and administrators of state-administered timber tracts offered for sale within the Lake States provide insight into recent changes to state timber tracts offered for sale and the relative impact various factors have on stumpage bidding behavior.

7.3.1. Important Characteristics of a Timber Tract

Loggers and foresters agree that summer logging access, substantial volumes of high quality wood, the presence of marketable species, high total timber volume per tract, and expectations about future stumpage prices are the most important factors firms consider when determining how much to bid for stumpage. Foresters tend to underestimate the impact of several factors influencing stumpage bids, including the presence of restrictive regulations and the forester who prepares and supervises the sale. Foresters overestimate the importance of a tract's proximity to a purchaser's existing sales and a purchaser's existing inventory of stumpage contracts. On average, stumpage purchasers believe most timber tract characteristics have become more important during difficult economic conditions.

7.3.2. Recent Changes to Tract Characteristics

Stumpage purchasers believe the characteristics of state timber tracts are changing in ways that potentially make it more difficult for the local wood products industry to operate profitably. They feel more sales have restrictive regulations today than in the past. They also believe fewer tracts have desirable characteristics for purchasers, such as contracts exceeding four years, summer logging access, a high volume of quality wood, and contain only marketable species.

Most foresters agree that states are offering more tracts with restrictive timber harvest regulations now than in the past. They also agree that, relative to previous years, fewer state timber tracts have contracts exceeding four years, contain high volumes of quality wood, and contain only marketable species.

7.3.3. Preferred Methods of Sale

Perceptions and opinions regarding auction methods (sealed vs. oral) and payment methods (lump sum vs. consumer scale) vary substantially.

A slight majority of loggers prefer to purchase stumpage at sealed bid auctions. Foresters and loggers agree on three key aspects of different auction methods: (1) sealed bid auctions reduce the bidding frenzy that can occur at oral auctions, (2) sealed bid auctions make it difficult for purchasers to achieve their ideal inventory of tracts, and (3) sealed bids force loggers to leave money on the table. Interestingly, even though many loggers believe they are forced to leave money on the table at sealed bid auctions, they are split with regard to which method results in higher prices paid for stumpage. Most foresters believe sealed bid auctions result in higher prices paid for stumpage.

Similar to auction methods, stumpage purchasers are split on whether they prefer a lump sum or consumer scale payment method. Purchasers typically believe lump sum sales require more effort to prepare a bid and are more financially risky. Foresters believe lump sum sales require more effort when preparing a sale, but may be less costly to oversee. Lump sum sales also may be more financially risky to the state.

7.4. Understanding Stumpage Prices and Bidder Behavior – Additional Considerations

The study findings help describe the impact various tract characteristics and timber sale administrative procedures and policies on stumpage bidding behavior in Minnesota, but they also highlight the degree to which other factors drive stumpage bidding behavior and prices. Firm-specific characteristics and statewide timber supply and demand are two major stumpage price drivers not specifically discussed in detail or identified in this study.

Despite using a variety of methods to quantify drivers of stumpage bidding, a large degree of variation between bids was caused by unobservable factors. These differences may be caused by the heterogeneous nature of Minnesota's stumpage bidder population. Minnesota stumpage purchasers range from global wood product manufacturers to independent, family-owned logging operations. Differences in stumpage bidding behavior are likely driven by firm-specific characteristics, such as a firm's inventory of stumpage contracts, ability to access capital and labor, and the markets for their harvested forest products. All these characteristics potentially have a significant influence on stumpage bidding behavior. Unfortunately, it is difficult to collect data on any of these factors to quantify and describe the impact of these characteristics on bidding behavior.

In addition to firm-specific characteristics, other highly influential factors driving stumpage price fluctuations are changes in statewide timber supply or demand. Since the annual volume of wood offered for sale on public lands is relatively stable in Minnesota, the most influential driver may be the demand for raw wood materials. The relationship between demand and prices has never been more evident than in recent years when several Minnesota wood product mills closed and, subsequently, state stumpage prices declined. Unfortunately for program administrators, statewide timber supply and demand are determined by outside forces, such as macroeconomic conditions, landscape-level forest planning decisions (e.g., total allowable cut), and government tax policies (e.g., corporate tax rates, business subsidies)—all characteristics that cannot be changed by timber sale program administrators. The strong influence of timber supply and demand does not imply administrative policies and procedures should be ignored. However, if

states are serious about making changes that generate maximum financial returns from forest management, state forest planners must consider the amount and type of stumpage offered on state-owned land and state lawmakers must consider the importance of maintaining a healthy wood products industry.

7.5. Opportunities for Future Research and Testing

There are several opportunities for future research and pilot projects that could generate valuable information about state timber sale program design and administration.

7.5.1. Intermediate Timber Sales

More research evaluating the different levels of competition within intermediate and regular auctions—data that may become more available now that the MN DNR has begun using more sealed bid auction methods—would help further evaluate the impact of their intermediate sale program on the small business community and overall health of the local wood products industry. A research effort that attempts to identify potential collaboration between large mills and logging businesses with 20 or fewer employees at intermediate auctions would also help assess the effectiveness of such a policy.

7.5.2. Reserve Prices

In order to set reserve prices that maximize gross timber sale revenue, more information is needed about the impact reserve prices have on the probability a tract receives at least one bid. Understanding this relationship has implications beyond revenue generation. It also affects the agency's ability to complete silvicultural prescriptions and achieve other forest management goals (e.g., vegetative management, wildlife habitat).

7.5.3. Auction Methods

More empirical research is needed to evaluate stumpage price differences between first-price sealed bid auctions and ascending oral bid auctions in Minnesota. Given that the MN DNR has increased its use of first-price sealed bid auctions in the past few years, the data needed to conduct such an analysis may now be available.

Also, the MN DNR and other public agencies should consider the merits of second-price sealed bid timber auctions (i.e., Vickrey auctions) (Vickrey 1961). Theoretically, second-price sealed bid auctions eliminate bidders' incentives to shade their bids and effectively elicit bids that reflect true willingness to pay (Klemperer 1999). They also potentially reduce the likelihood of preclusive and exorbitant bidding. Despite these attractive theoretical properties, no state timber sale programs utilize second-price sealed bid auctions. From a practical perspective, neither state agencies nor stumpage purchasers may support a process where the successful bidder only has to pay the second highest bid price for the timber. However, public agencies would be wise to explore the merits of this auction method in a real-world setting, possibly through pilot testing with a small number of timber sales.

7.5.4. Log Sort Sale Methods

Several states utilize log sort sale methods—a process whereby the state enters into contracts with independent loggers to harvest and transport stumpage to state-run log sort yards where it is sorted by the state and sold to purchasers. Supervisors from these states support this process and

believe the method allows the state to capture additional value from the timber. It may be worthwhile to pilot test a log sort program in Minnesota to further assess advantages and disadvantages.

7.5.5. Procedures to Reward Good Loggers

States already have punitive actions in place to address situations when a buyer does not perform adequately. Options include shutting down the operation, fines, and requiring corrective actions. States should look for ways to reward reliable, high quality purchasers. States rely heavily on the performance of purchasers to carry out the vegetative management actions needed to manage their forest resource. Programs could benefit from the adoption of procedures that reward operators who display a commitment to following best management practices and meeting other contract obligations, possibly in the form of bidding preference on state timber tracts offered for sale or financial payments to loggers following successful harvest operations.

7.5.6. Incentives to Encourage Timely Harvests

States should consider using incentives to encourage quicker timber harvests. Timber sale contract provisions should provide loggers adequate time and flexibility to manage their portfolio of timber sales, yet encourage them to harvest the timber within a time frame that will achieve the silvicultural objectives for the stand. Charging the holders of state timber sale permits interest on the value of uncut timber is one potential means by which this could be achieved.

8. References

- Barlow, T.J., G.E. Helfand, T.W. Orr, and T.B. Stoel. 1980. *Giving away the national forests: An analysis of U.S. Forest Service timber sales below cost*. Washington, D.C.: Natural Resources Defense Council.
- Brannman, L.E. 1991. Hauling distance in Forest Service timber sales: Economic efficiency in oral and sealed bidding. *Journal of Forestry* 89(2):18-21.
- Breusch, T.S. and A.R. Pagan. 1979, Simple test for heteroscedasticity and random coefficient variation. *Econometrica* 47(5):1287-1294.
- Bulow, J.I. and P.D. Klemperer. 1996. Auctions vs. negotiations. *American Economic Review*. 86:180-194.
- Buongiorno, J. and T. Young. 1984. Statistical appraisal of timber with an application to the Chequamegon National Forest. *Northern Journal of Applied Forestry* 1:72-76.
- Carter, D.R., and D.H. Newman. 1998. The impact of reserve prices in sealed bid federal timber sale auctions. *Forest Science* 44:485-495.
- Clawson, M. 1976. The national forests. *Science*. 191:762-767.

- Cooper C.P., C.M. Jorgensen, and T.L. Merritt. 2003. Telephone focus groups: an emerging method in public health research. *Journal of Women's Health* 12:945-951.
- Dahal, P., and S.R. Mehmood. 2005. Determinants of timber bid prices in Arkansas. *Forest Products Journal* 55(12):89-94.
- Dillman, D. 2000. *Mail and Internet Surveys: The Tailored Design Method*. Wiley and Sons, New York.
- Dunn, M.A, and M.R. Dubois. 2000. Determining econometric relationships between timber sale notice provisions and high bids received on timber offerings from the Alabama department of conservation/state lands division. In *Timberland investments: Improving the odds*, eds. I.A. Munn, S.H. Bullard, S.C. Grado, and C.L. Donald, 83-90. Proceedings from the 1999 Southern Forest Economics Workshop, Apr. 18-20. Biloxi. MS: Mississippi State University, Department of Forestry, Forest and Wildlife Research Center.
- Ellefson, P.V., M.A. Kilgore, and J.E. Granskog. 2006. State government regulation of forestry practices applied to nonfederal forests: extent and intensity of agency involvement. *Journal of Forestry* 104(8):401-406.
- Freeman, A.M. III. 1974. *The Benefits of Environmental Improvements*. Baltimore, MD: John Hopkins Press.
- Governor's Task Force on the Competitiveness of Minnesota's Primary Forest Products Industry. 2006. Final report to the Governor. December 15, 2006. St. Paul, MN.
- Griliches, Z. 1971. *Price Indices and Quality Change*. Cambridge, MA: Harvard University Press.
- Haley, M.R. 2009. Bounding revenue leakages at scale-bid timber auctions: Evidence from Wisconsin state forest auctions. *Empirical Economics* Online First (66).
- Halverson, R. and R. Palmquist. 1980. The interpretation of dummy variables in semilogarithmic equations. *American Economic Review* 70(2):474-475.
- Hansen, R.G. 1986. Sealed-bid versus open auctions: the evidence. *Economic Inquiry* 24:125-142.
- Haynes, R.W. 1980. Sealed bidding and activity of outside bidders for national forest timber. *Journal of Forestry* 78(6):344-346.
- Huang, F.M., and J. Buongiorno. 1986. Market value of timber when some offerings are not sold: Implications for appraisal and demand analysis. *Forest Science* 32(4):845-854.
- Huebschmann, M.M., T.B. Lynch, D. K. Lewis, D.S. Tilley, and J.M. Guldin. 2004. A bid price equation for timber sales on the Ouachita and Ozark National Forests. In *Proceedings of the*

12th Biennial Southern Silvicultural Research Conference, ed. K.F. Connor. Gen. Tech. Rep. SRS-71. Asheville, NC: USDA Forest Service, Southern Research Station.

Jackson, D.H. 1987. Why stumpage prices differ between ownerships: A statistical examination of state and Forest Service sales in Montana. *Forest Ecology and Management* 18:219-236.

Jackson, D.H., and A.G. McQuillan. 1979. A technique for estimating timber value based on tree size, management variables, and market conditions. *Forest Science* 25(4):620-626.

Johnson, R.N. 1979. Oral auction versus sealed bids: An empirical investigation. *Natural Resources Journal* 19:315-335.

Kilgore, M.A., C. Hibbard, and P.V. Ellefson. 2006. Comprehensive strategic planning for the use and management of forest resources: The experiences of state governments in the United States. *Forest Policy and Economics* 9(1):42-49.

Kilgore, M.A., and C.R. Blinn. 2003. The financial cost to forest landowners who implement forest management guidelines: An empirical assessment. *Journal of Forestry* 101(8):37-41.

Kilgore, M.A., and C.R. Blinn. 2004. Policy tools to encourage the application of sustainable timber harvesting practices in the United States and Canada. *Forest Policy and Economics* 6(2):111-127.

Klemperer, P. 1999. Auction theory: A guide to the literature. *Journal of Economic Surveys* 13(3):227-286.

Klemperer, P. 2002. What really matters in auction design. *Journal of Economic Perspectives* 16(1):169-189.

Koontz, T.M. 1997. Differences between state and federal public forest management: the importance of rules. *Publius* 27(1):15-37.

Krueger, R.A., and M.A. Casey. 2009. *Focus Groups: A Practical Guide for Applied Research*. 4th ed. Thousand Oaks, CA: Sage Publications, Inc.

Leal, D.R. 1995. Turning a profit on public forests. *PERC Policy Series* PS-4. Bozeman, MT: Political Economy Research Center.

Leefers, L.A., and K. Potter-Witter. 2006. Timber sale characteristics and competition for public lands stumpage: A case study from the Lake States. *Forest Science* 52(4):460-467.

Leffler, K., and R. Rucker. 1991. Transaction costs and the efficient organization of production: A study of timber-harvesting contracts. *Journal of Political Economy* 99:1060-1087.

Leland, H.E. 1978. Optimal risk sharing and the leasing of natural resources, with application to oil and gas leasing on the OCS. *Quarterly Journal of Economics* 92:413-437.

- Ma, Z., D.R. Becker, and M.A. Kilgore. 2009. The integration of cumulative environmental impact assessments and state environmental review frameworks. Staff Paper Series 201. St. Paul, MN: University of Minnesota, Department of Forest Resources.
- MacKay, D.G., and M.J. Baughman. 1996. Multiple regression-based transactions evidence timber appraisal for Minnesota's state forests. *Northern Journal of Applied Forestry* 13(3): 129-134.
- Maroaka, D.D., and R.B. Watson. 1983. Improving the efficiency of federal timber sale procedures. *Natural Resources Journal* 23:815-825.
- Maroaka, D.D., and R.B. Watson. 1986. Improving the efficiency of federal timber sale procedures: An update. *Natural Resources Journal* 26:69-76.
- McAfee, R.P., and J. McMillan. 1987. Auctions and bidding. *Journal of Economic Literature* 25: 699-738.
- McGee, T. 1997. Getting inside kids' heads. *American Demographics* 19:52-55,59.
- Mead, W.J., A. Moseidjord, D. Muraoka, and P. Sorensen. 1985. Offshore lands: oil and gas leasing and conservation on the outer continental shelf. San Francisco: Pacific Institute of Public Policy Research.
- Minnesota Department of Natural Resources. 2006a. Minnesota's Forest Resources. St. Paul, MN: Division of Forestry.
- Minnesota Department of Natural Resources. 2006b. Minnesota's School Trust Lands: Biennial Report. St. Paul, MN.
- Minnesota Department of Natural Resources. 2008. Minnesota's Forest Resources. St. Paul, MN: Division of Forestry.
- Minnesota Department of Natural Resources. 2010. Minnesota Public Stumpage Price Review and Price Index. The Minnesota Department of Natural Resources Web Site (online). Accessed 2010-1-15 at <http://www.dnr.state.mn.us/sitetools/copyright.html>
- Minnesota Office of the Legislative Auditor. 1982. Evaluation of State Timber Sales. St. Paul, MN: OLA Program Evaluation Division, Office of the Legislative Auditor, State of Minnesota.
- Munn, I.A., and R.R. Rucker. 1995. An economic analysis of the differences between bid prices on Forest Service and private timber sales. *Forest Science* 41(4):823-840.
- Nautiyal, J.C., S. Kant, and J.S. Williams. 1995. A transaction evidence based estimate of the stumpage value of some southern Ontario forest species. *Canadian Journal of Forest Resources* 25(1995):649-658.

- Niquidet, K., and G.C. van Kooten. 2006. Transaction evidence appraisal: competition in British Columbia's stumpage market. *Forest Science* 52(4):451-459.
- Phillips, M. J., and C. R. Blinn. 2007. Practices evaluated and approaches used to select sites for monitoring the application of Best Management Practices: A regional summary. *Journal of Forestry* 105(4):179-183.
- Puttock, G.D., D.M. Prescott, and K.D. Meilke. 1990. Stumpage price in southwestern Ontario: A hedonic function approach. *Forest Science* 36(4):1119-1132.
- Reiley, D.H. 2006. Field experiments on the effects of reserve prices in auctions: more 'Magic' on the Internet. *RAND Journal of Economics* 37(1):195-211.
- Riley, J.G., and W.F. Samuelson. 1981. Optimal auctions. *American Economic Review* 71:381-92.
- Rosen, S. 1974. Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy* 82(1):34-55.
- Ross, L.E., L.A. Stroud, S.W. Rose, and C.M. Jorgensen. 2006. Using telephone focus groups methodology to examine the prostate cancer screening processes of African-American primary care physicians. *Journal of the National Medical Association* 98(8):1296-1299.
- Sendak, P.E. 1991. Timber sale value as a function of sale characteristics and number of bidders. Research Paper NE-657. Radnor, PA: USDA Forest Service, Northeastern Forest Experiment Station.
- Sendak, P.E. 1992. State and federal timber stumpage prices in Vermont. *Northern Journal of Applied Forestry* 9(3):97-101.
- Sendak, P., and T. McEvoy. 1989. Recent trends in Vermont stumpage prices. *Forest Products Journal* 39(4):20-26.
- Smith, K., and T. Bers. 1987. Improving alumni survey response rates: An experiment and cost-benefit analysis. *Research in Higher Education* 27:218-226.
- Smith, W.B., P.D. Miles, C.H. Perry, and S.A Pugh. 2009. Forest Resources of the United States, 2007. Gen. Tech. Rep. WO-78. Washington, DC: USDA, Forest Service.
- Souder, J.A., and S.K. Fairfax. 1992. *State Trust Lands: History, Management, and Sustainable Use*. Lawrence, KS: University Press of Kansas.
- Stewart, D.W., and P.N. Shamdasani. 1990. *Focus Groups: Theory and Practice*. Newbury Park, CA: Sage Publications, Inc.

- United States Department of Agriculture, Forest Service. 1997. A Nationwide Study Comparing Tree Measurement and Scaled Sale Methods for Selling United States Forest Service Timber. Prepared by Natural Resources Management Corporation, June 1.
- U.S. General Accounting Office. 1996. Public Timber: Federal and State Programs Differ Significantly in the Pacific Northwest. Washington, DC. GAO/RCED-96-108.
- Vickrey, W. 1961. Counterspeculation, auctions and competitive sealed tenders. *Journal of Finance* 16:8-37.
- White, H. 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica* 48(4):817-838.
- Wiener, A.A. 1979. Sealed bids or oral auctions: which yield higher prices? *Journal of Forestry* 77(6):353-356.
- Wooldridge, J.M. 2006. *Introductory Econometrics*. Third Edition. Mason, OH: Thomson South-Western.

Appendix A:
Questionnaire Sent to State Timber Sale Program
Supervisors

Questionnaire on State Timber Sale Programs: Policies, Procedures, and Perceptions

As part of a study being conducted by the University of Minnesota on state timber sale program design, we are asking each state to complete this questionnaire. The questionnaire, which requests information and opinions on your state's timber sale program, should be completed by the person who has lead responsibility for supervising this program. The study seeks information regarding the policies and procedures used to sell wood on state-administered timberland only. In this questionnaire, state-administered timberland is defined as land where:

- 1) the state owns fee title to the land;
- 2) state agencies are given the responsibility of managing the land according to state constitution and/or statute;
- 3) excess of 20 cubic feet per acre per year of wood is capable of being grown; and
- 4) timber utilization (i.e., timber harvests) is legal.

This does not include lands owned by the state, but administered by other entities (e.g., counties). It also does not include privately owned land that receives management assistance from state forestry agencies.

Many state agencies have developed programs responsible for selling timber on state-administered land, henceforth referred to as timber sale programs. These programs typically have many responsibilities, including planning and preparing the sales, offering the sales, and administering the timber harvests on state-administered forest land. Timber sales that occur on other lands within your state, such as federal or private lands, are not the subject of this study.

Some of the questions ask for your perceptions about timber sale program administration and opinions regarding potential program improvements. Your responses to questions about perceptions and opinions about your state's timber sale program will be kept completely confidential. Only summaries of responses to questions asking for your perceptions and opinions will be reported—no individual responses will be attributed to specific states or specific survey respondents.

If you have any questions, please contact:

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Please return the questionnaire in the enclosed self-addressed, postage-paid envelope by May 27, 2009.

Thank you for your participation!

I. State Timber Sale Program Information

In this section, we would like you to provide some basic information about yourself and state-administered timberland in your state. (*Definition of state-administered timberland and state timber sale program is on page 15*)

1. Name and contact information of the person who completed the questionnaire:

Name _____

Title _____

Agency/Organization _____

Years of Experience with Agency/Organization _____

Years of Experience with Agency's Timber Sale Program _____

Phone Number _____

Email Address _____

2. Approximately how many acres of state-administered timberland exist in your state?

_____ acres

3. Approximately how many acres of state timberland does your agency administer?

_____ acres

3a. In addition to your agency, please list any other agencies responsible for administering state timberland in your state.

Timber sale program statutes, rules, and guidelines

4. State timber sale programs receive direction from a variety of sources. Please indicate the state constitutional articles, statute codes, administrative rule chapters, and/or agency guidelines that guide the direction of your agency's program.

Constitutional Article(s):

State Statute Code(s):

Administrative Rule(s):

Agency guidelines, manuals, or policy directives (*Please provide a title or web link*):

Other (please specify):

5. Indicate the extent to which you perceive the following sources influence the administration of your state agency's timber sale program. Please circle one number for each source of direction.

	No Influence	Minor Influence	Moderate Influence	Major Influence	Not Applicable
State Constitution	1	2	3	4	5
State Statute	1	2	3	4	5
Administrative Rules	1	2	3	4	5
Agency guideline, manual, policy directive	1	2	3	4	5
Property Management Plans	1	2	3	4	5
Other, specify: _____	1	2	3	4	5

Timber sale program goals

6. State timber sale programs often operate under a wide variety of program goals. Does your state's constitution or statutes require your agency to manage forest land for any of the following goals? Please circle one number for each goal.

	Yes	No	Not Sure
Protect soil quality	1	2	3
Protect wildlife habitat	1	2	3
Enhance water quality	1	2	3
Promote biological diversity	1	2	3
Reduce wildfire risk	1	2	3
Enhance recreation opportunities	1	2	3
Maximize financial returns	1	2	3
Sustained timber yield	1	2	3
Support local economy	1	2	3
Other, specify: _____	1	2	3

7. How do you perceive the relative importance of each program goal? Please circle one number for each goal.

	Not Important	Minor Importance	Moderate Importance	Very Important	Not Applicable
Protect soil quality	1	2	3	4	5
Protect wildlife habitat	1	2	3	4	5
Enhance water quality	1	2	3	4	5
Promote biological diversity	1	2	3	4	5
Fire protection/management	1	2	3	4	5
Recreation opportunities	1	2	3	4	5
Generate financial returns	1	2	3	4	5
Sustain timber yield	1	2	3	4	5
Support local economy	1	2	3	4	5
Other, specify: _____	1	2	3	4	5

Annual State Timber Sale Program Activity

8. Estimate the average number of annual full-time equivalent (FTE) permanent and seasonal employees within your agency directly involved in administering your state's timber sale program over the last 10 years. Also, indicate the approximate annual budget for field and administrative operations. Please answer to the best of your ability. If your program does not time code for field vs. administrative operations, please complete the information for "All Timber Sale Program Operations."

Program Operation	# of FTEs	# of seasonal employees	Annual Budget (\$)
Field Operations This includes: <ul style="list-style-type: none"> • Personnel (e.g., foresters, technicians) • Timber sale appraisal (e.g., cruising) 	_____	_____	\$ _____/year
Administrative Operations This includes: <ul style="list-style-type: none"> • Personnel (e.g., supervisors, clerical staff) • Operational budget (e.g., rent, office supplies, travel, tree marking supplies) • Database management & accounting (e.g., billing procedures) 	_____	_____	\$ _____/year
All Timber Sale Program Operations <ul style="list-style-type: none"> • Field Operations • Administrative Operations 	_____	_____	\$ _____/year

9. Approximately how much stumpage volume did your agency sell on state-administered timberland in 1998 and in 2008? Please indicate cords, thousand board feet (MBF), cubic feet, and/or green tons.

	<u>1998</u>	<u>2008</u>
Cords	_____	_____
MBF	_____	_____
Ft3	_____	_____
Green tons	_____	_____

10. Over the last 10 years, estimate the percent of total stumpage volume sold on your agency's state-administered timberland that falls into each of the following species-product categories. *Specify a percentage for each group.*

_____ % Softwood pulpwood
 _____ % Hardwood pulpwood
 _____ % Softwood sawtimber or veneer
 _____ % Hardwood sawtimber or veneer
 _____ % Energy biomass
 _____ % Other/specialty products, please specify: _____
 _____ % Other/specialty products, please specify: _____

Total: 100 %

11. How many acres of state-administered timberland are currently under long-term leases (10+ years) with the private sector for the primary purpose of timber management? *Please indicate the number of acres.*

_____ acres

12. How many tracts of timber did your agency sell in 2008? Please include both the number of sales and the total number of acres. *Please indicate the number of timber sales and the total number of acres.*

_____ # of sales

_____ total acres

13. Please describe the approximate size and value your agency's typical timber sale on state-administered timberland in 1998 and in 2008.

	<u>1998</u>	<u>2008</u>
<i>Typical Sale Area</i>		
Acres per sale	_____	_____
<i>Typical Sale Volume (complete all that apply)</i>		
Total volume per sale (be sure to specify volume measure)	_____	_____
<i>Typical Sale Value</i>		
Gross revenue per sale	\$ _____	\$ _____

Statewide Timber Sale Activity

14. Estimate the percent of total stumpage volume sold in your state in the years 1998 and 2008 by each forest land ownership group. *Please indicate a percent for each ownership group in both years.*

	<u>1998</u>	<u>2008</u>
Federal	_____ %	_____ %
State (from your state agency)	_____ %	_____ %
County/local	_____ %	_____ %
Industry	_____ %	_____ %
NIPF	_____ %	_____ %
Other, specify: _____	_____ %	_____ %
Total: 100 %		Total: 100 %

Local Wood Products Industry

15. Indicate the approximate breakdown of businesses and individuals that purchased stumpage directly from your agency's timber sale program in 2008. Please specify the average annual number of bidders and the approximate percentage of total annual volume sold to each group of purchasers.

	Average # of firms that bid on state timber sales each year	Average annual % of state stumpage volume purchased
Independent logging companies	_____	_____ %
Wood brokers	_____	_____ %
Forest products industry	_____	_____ %
Energy companies	_____	_____ %
Other, specify: _____	_____	_____ %
Total:		100 %

16. For each distance category listed below, estimate the percent of stumpage from your agency's timber sales that is transported the following distances to a processing facility. Please specify a percent for each distance. Please do your best to estimate these percentages, even if you do not have data to confirm the estimates.

_____ % 200+ miles
_____ % 150-199 miles
_____ % 100-149 miles
_____ % 50-99 miles
_____ % less than 50 miles

Total: 100 %

17. Estimate the percent of total harvest volume from your state-administered timberland that is used to produce the following products. Please specify a percent for each category. Please do your best to estimate these percentages, even if you do not have data to confirm the estimates.

_____ % Paper
_____ % Structural panels (Plywood, OSB, etc.)
_____ % Lumber
_____ % Veneer, furniture, or other specialty products
_____ % Energy
_____ % Other, please specify: _____

Total: 100 %

II. Methods of Selling Timber

In this section, we would like you to provide information about the specific policies and procedures currently used to sell timber on state-administered timberland (i.e., 2008 timber sales). Please answer the questions to the best of your ability. **Remember: all responses to questions about your perceptions and opinions will be kept confidential.**

Auction Methods

- 18. Approximately what percent of stumpage volume did your agency offer for sale at a public auction in 2008? Please indicate a percent. Skip to Question 24 if your agency did not conduct public timber auctions during this time period.**

_____ % of total volume sold at a public auction

- 19. Of the total stumpage volume offered for sale by your agency at public auction in 2008, indicate the type of auction used. Please indicate of percent of total volume sold at each auction type.**

_____ % Oral auction (ascending price oral auction)

_____ % Sealed bid auction (first-price sealed bid auction)

_____ % Dutch auction (descending price oral auction)

_____ % Vickrey auction (second-price sealed bid auction)

_____ % Other, please specify: _____

Total: 100 %

- 20. If sealed auctions are used, how are sealed bids for your agency's timber sales submitted? Please check all that apply.**

_____ Each species-product group receives a separate bid.

_____ One bid is applied to all species and products on the sale.

_____ Other, please specify: _____

- 21. Estimate the typical distribution of bidding activity for your state agency's timber auctions (generalize for all types of auction methods). Please indicate a percentage of the total number of auction sales. Please do your best to estimate these percentages, even if you do not have data to confirm the estimates.**

_____ % 0 bidders per sale

_____ % 1-2 bidders per sale

_____ % 3-4 bidders per sale

_____ % 5-6 bidders per sale

_____ % 7-8 bidders per sale

_____ % 9-10 bidders per sale

_____ % 11+ bidders per sale

Total: 100%

- 22. Please describe important changes in your agency's timber sale auction procedures in the last 10 years. Please include the reason for each change.**

23. In your opinion, describe how your agency could improve its timber sale auction procedures.

Stumpage Appraisal Methods

In this section, we would like you to provide information about your agency's methods for estimating the value of timber offered for sale on state-administered land. **Important: See page 15 for definitions of appraised stumpage prices and minimum acceptable bid prices.**

24. How does your agency estimate appraised stumpage prices for timber you offer for sale? *Please check all that apply.*

- ☐ Results from past timber sales are used to estimate current appraised stumpage prices.
- ☐ Estimated difference between delivered wood prices and harvest and transportation costs *(Skip to Question 30 if you *only* checked this response)*
- ☐ Other, please specify: _____

25. If past timber sales are used to establish current stumpage prices, which ownership groups are used to calculate appraised stumpage prices? *Please check all that apply.*

- ☐ Federal auctions
- ☐ State auctions
- ☐ County or local auctions
- ☐ Private auctions
- ☐ Other, please specify: _____

26. What timeframe is typically used to calculate appraised stumpage prices? *Please check only one.*

- ☐ The last 3 months
- ☐ The last 6 months
- ☐ The last 9 months
- ☐ The last 12 months
- ☐ The last 24 months
- ☐ Other, please specify: _____

27. How often are appraised stumpage prices determined? Please check only one.

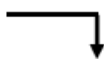
- ☐ Every 3 months
- ☐ Every 6 months
- ☐ Every 9 months
- ☐ Once a year
- ☐ Other, please specify: _____

28. Identify the types of sales that are excluded from the calculation of appraised stumpage prices. Please check all that apply

- ☐ Salvage sales
- ☐ No-bid auction sales
- ☐ Non-auction sales
- ☐ Abnormally high bid sales
- ☐ Low-value tracts
- ☐ Other, please specify: _____

29. Does your agency calculate separate appraised stumpage prices for different regions of your state? Please check only one.

- ☐ No → CONTINUE TO QUESTION 30
- ☐ Yes



29a. If you answered YES to Question 29, how are regions separated for the purpose of estimating stumpage values? Please check all that apply.

- ☐ Ecologically
- ☐ Administratively (e.g., political boundaries)
- ☐ Other, please specify: _____

30. Indicate which of the following site specific factors may be used to adjust the appraised stumpage prices of a timber sale before it is offered for sale. Please check all that apply.

- ☐ Topography and soils
- ☐ Volume/acre of wood offered for sale
- ☐ Hauling distance
- ☐ Quality of wood
- ☐ Silvicultural prescription
- ☐ Access characteristics
- ☐ Market conditions
- ☐ Site-level guidelines (e.g., water quality)
- ☐ Other, please specify: _____

31. Are appraised stumpage prices different from the minimum acceptable bid prices used at auctions of state-administered timber sales? (*Definitions for appraised prices and minimum acceptable bid prices appear on page 15*) Please check only one.

_____ No → CONTINUE TO QUESTION 32

_____ Yes



- 31a. If you answered YES to Question 31, describe the method used to determine minimum acceptable bid prices?

32. Please describe any significant changes in your agency's method of estimating stumpage prices and/or setting minimum acceptable bid prices in the last 10 years. Please include the reason for each change.

33. In your opinion, describe how your agency could improve its method of estimating stumpage prices and/or setting minimum acceptable bid prices.

Timber Sale Contract Provisions

34. Estimate the length of time stumpage purchasers are given to harvest the wood offered for sale on state-administered timberland in 2008. Please ignore salvage sales and extensions to the original contract. Please indicate a percentage of total stumpage volume offered for sale.

_____ % 1 year or less

_____ % Up to 2 years

_____ % Up to 3 years

_____ % Up to 4 years

_____ % Up to 5 years

_____ % Other, please specify: _____

Total: 100 %

35. What are the penalties for requesting a contract extension? *Please check all that apply.*

- ☐ Stumpage price is reappraised to reflect current market prices
- ☐ Stumpage price is adjusted according to a predetermined %
- ☐ Stumpage price is adjusted according to current interest rates
- ☐ No penalties for a contract extension
- ☐ Other, please specify: _____

36. What are the penalties for **defaulting** on a timber sale contract? *Please check all that apply.*


- ☐ Forfeit amount of money already collected (e.g., down payment)
- ☐ Charged the full bid value of the sale
- ☐ Charged the full appraised value of the sale
- ☐ Other, please specify: _____

37. Please describe any significant changes in your agency's timber sale **contract provisions** in the last 10 years. Please include the reason for each change.

38. In your opinion, describe how your agency could improve its timber sale contract provisions.

Opportunities for smaller businesses

39. Some public agencies make a portion of their timber sales only available to smaller businesses (e.g., the USFS small business set aside program). Does your agency's timber sale program restrict participation in a way that gives smaller businesses opportunities to purchase stumpage? *Please check only one.*

- ☐ No → *CONTINUE TO QUESTION 40*
- ☐ Yes 

39a. If you answered YES to Question 39, describe how these sales are different from your typical timber sales. Please check all that apply and complete the statement.

- ☐ Only businesses with less than _____ (indicate #) employees may bid
- ☐ Only businesses that harvest less than _____ (indicate volume) may bid
- ☐ Businesses may only purchase _____ % (indicate percent) of total sales
- ☐ Sales must be less than _____ (indicate a size)
- ☐ Other, please specify: _____

40. Please describe any significant changes in your agency's timber sale program to provide more opportunities for smaller businesses in the last 10 years. Please include the reason for each change.

41. In your opinion, describe how your agency could improve its policy of providing opportunities for smaller businesses.

Timber Sale Access Responsibilities

42. Who is responsible for securing access rights to a timber sale across adjacent lands? Please check only one.

- ☐ State forestry agency
- ☐ Timber sale purchaser
- ☐ Other, please specify: _____

43. Estimate the percent of total road construction costs each entity is responsible for paying to access a state-administered timber sale. Indicate a percent of total costs.

- ☐ % State forestry agency
- ☐ % Timber sale purchaser
- ☐ % Other, please specify: _____

Total: 100 %

44. Describe any significant changes in your agency's policy towards road construction and access responsibilities in the last 10 years. Please include the reason for each change.


Timber Sale Billing Procedures

45. Indicate the mechanism by which your agency's stumpage volume is offered for sale. Indicate a percent of total stumpage volume for each category.

_____ % Sold on Appraised Volume (SOAV) only (i.e., lump sum sales)
_____ % Scaled and reported after harvest
_____ % Purchaser optional SOAV or scaled
_____ % Other, please specify: _____

Total: 100 %

46. Does your agency adjust (i.e., index) the price paid for timber between the date of sale and the time of harvest? Please check only one.

_____ No → CONTINUE TO QUESTION 47
_____ Yes 

- 46a. If you answered YES to Question 46, please describe how timber prices are adjusted between the date of sale and the time of harvest.

47. Describe the timing of the payments made for your agency's timber sale. Indicate the percent of total payment made at each point in time and circle one of the associated options.

_____ % Appraised/bid value (*circle one*) paid at the time of the sale/purchase
_____ % Bid value immediately before harvest
_____ % Bid value during the harvest every month/quarter/year (*circle one*)
_____ % Bid value after harvest is complete
_____ % Other, please specify: _____

Total: 100 %

48. Describe any significant changes in your agency's timber sale billing procedure over the last 10 years. Please include the reason for each change.

49. In your opinion, describe how your agency could improve its timber sale billing procedure.

III. Additional Information

50. Please share any additional information about your agency's timber sale program design you feel is significant, but that we failed to address in our previous questions.

51. As a follow-up to this questionnaire, we will be conducting one-hour telephone focus groups with select state timber sale program supervisors from across the U.S. This meeting will occur in late spring 2009. Would you be interested in participating in a telephone (or webcast) focus group? *Please check only one.*

- ☐ Yes, I am willing to participate
☐ Maybe
☐ No, I am not willing to participate

Thank you for taking time to complete the questionnaire!
If you are interested in the results of the survey, please check here: ☐

Please return the questionnaire and any attached documents by May 27, 2009.

Glossary

State-administered land: Many states have acquired forest land through a combination of land grants, land exchanges, and tax-forfeitures. State-administered land is land where: 1) the state owns fee title to the land and; 2) state agencies are given the responsibility of managing the land according to state constitution and/or statute. This does not include lands owned by the state, but administered by other entities (e.g., counties). It also does not include privately owned land that receives management assistance from state forestry agencies.

Timberland: Timberland, as defined by the US Forest Service's FIA program, is forest land capable of growing in excess of 20 cubic feet per acre per year and not legally withdrawn from timber utilization. A significant portion of state-administered forest land, such as state parks, may not qualify as timberland because timber utilization is not allowed.

State timber sale program: Many state agencies have developed programs responsible for selling timber on state-administered land. These programs typically have many responsibilities, including planning and preparing the sales, offering the sales, and administering the timber harvests.

Appraised stumpage prices: The state's estimated value of standing wood on a timber sale, in terms of \$/unit volume or total sale value (\$). Some agencies use the term "base stumpage prices" instead of appraised stumpage prices.

Minimum acceptable bid price: The minimum bid your state is willing to accept for a timber sale at an auction, in terms of \$/unit volume or total sale value (\$). Minimum bid prices are typically related to appraised stumpage prices, but may not be identical.

Appendix B:

Questioning Route for Focus Groups with State Timber Sale Program Supervisors.

State Timber Sale Program Supervisor Telephone Focus Group

The goal of this group is to identify barriers to efficient timber sale operations and identify opportunities to enhance state timber sale programs' ability to 1) reduce administrative costs/time, 2) receive a fair market value for state stumpage, and/or 3) meet management objectives.

Questions (and estimated time spent on each question):

1. (10 minutes) To get more familiar with each other, we'll go around the group and have each person take a minute to state your name, the state agency you work for, and a funny/unique story from your time working in forestry.
2. (10 minutes) Please take a minute to describe some of the policies and procedures used by your state's timber sale program. In your description, please tell us about your program's auction method (oral vs. sealed), payment method (lump sum vs. scaled), and typical contract length. Are there any aspects of your state program that you believe are relatively rare or unique?
3. (15 minutes) What timber sale policies, procedures and/or contract requirements used by your state are particularly effective in helping your program meet its goals (e.g., meeting management objectives, receiving fair market value for stumpage, reducing administrative costs/time)? What makes these procedures effective?
4. (15 minutes) What are some of the issues or problems associated with your state's policies, procedures, and/or contract requirements that make it difficult for you to administer your program effectively or efficiently?
5. (20 minutes) What are some potential changes that could be made to your program that would improve your program's effectiveness and/or administrative efficiency? How would these changes help your program?
6. (15 minutes) Given the opportunity, what are the top three improvements you would make to your state's timber sale program? What are the issues or problems you would try to address with each improvement?
7. (5 minutes) The purpose of this study is to identify opportunities to improve state timber sale program operations. Is there anything that we missed in this conversation? Is there anything that you would like to say that you didn't get a chance to say?

Appendix C:
Examples of Materials Used to Elicit Paired Bids.



Minnesota Department of Natural Resources
Division of Forestry - Timber Sales Program
TIMBER AUCTION - SEALED BID FORM

Submit bid to:

Timber Program Forester
DNR Forestry - Northwest Region
6603 Bemidji Avenue North
Bemidji, MN 55601-8669

Forestry Area Bemidji Area	
Bid Submission Deadline 1:00 PM on November 24, 2008	
Auction Type Regular Auction	
Tract Number B10	Permit Number B010679



The resource management of the Minnesota DNR's state forests and wildlife management areas meets the objectives of the SFI® program (Certificate No. 6Y921-S1) and the principles of the FSC® certification standard (Certificate No. SCS-FM/COC-088N).



Each bidder must fill out the Percent Bid-Up, Name, Address, etc. information below and must sign the form. Each bid must be submitted in a separate envelope, marked with the tract number (B10) and bidder's name, to the above address prior to the bid submission deadline (Monday, November 24, 2008 at 1:00 PM). On intermediate auctions, a bidder is limited to the purchase of no more than 25% of the tracts offered on the first round of bidding.

Percent Bid-Up is the percent bid above the appraised unit price(s). For example, a Percent Bid-Up of 50% on a Species/Product with a Unit Price of \$10.00 is calculated as follows: 1.50 multiplied by \$10.00 equals \$15.00 per cord. The Percent Bid-Up will be applied to all Species/Products listed with a plus symbol (+) in the Bid Species column. Bid unit prices will be rounded to the nearest whole cent.

The successful bidder must remit an advance payment of **\$1,008.90** (fifteen percent of the total appraised value) within ten (10) business days of the bid submission deadline (November 24, 2008). Failure to do so will result in forfeiture of the permit while still being liable to the State for the advance payment. Forfeited permits may be immediately awarded to the next highest eligible bidder.

My bid for the Species/Products listed
on the next page for this tract is:

Percent Bid-Up
(1% increments only)

%

This version of the tract is the
original appraised version.

Important: You must also submit a completed Sealed Bid Form on Tract Number B10-A for this bid to be valid.

Please answer the following two questions to the best of your ability assuming you are the successful bidder. Individual responses will be kept confidential and will not be shared with other bidders. **You must answer both questions in order for your bid to be valid.**

1. When do you expect to harvest this tract? _____ years from now
2. For the timber offered for sale on this tract, how do you expect average stumpage prices to change by the time you harvest this tract (identified in Question #1)?

Please check one, and where applicable, indicate a percent change in stumpage prices.

☐ Decrease by _____ % ☐ No change ☐ Increase by _____ %

Name in which permit will be issued (PRINT or TYPE)

Title

Address (Complete Business Address)

Telephone Number (for notification purposes)

Authorized signature (IN INK)



Minnesota Department of Natural Resources
Division of Forestry - Timber Sales Program
TIMBER AUCTION - SEALED BID FORM

Page 2 of 2

Forestry Area Bemidji Area	
Bid Submission Deadline 1:00 PM on November 24, 2008	
Auction Type Regular Auction	
Tract Number B10	Permit Number B010679

Permit Expiration Date 11/24/2011

Species/Product List:

SOAV *	Species/Product	Appraised Quantity	Unit	Unit Price	Appraised Value	Bid Species +
	Trembling Aspen/Woodsrun Cordwood	250.00	Cd	\$ 18.00	\$ 4,500.00	+
	Red Oak/Woodsrun Cordwood	85.00	Cd	\$ 13.20	\$ 1,122.00	+
	Norway Pine/Woodsrun Cordwood	55.00	Cd	\$ 15.00	\$ 825.00	+
	Northern Hardwoods/Woodsrun Cordwood	45.00	Cd	\$ 6.20	\$ 279.00	+
Total Appraised Value					\$ 6,726.00	

See the Timber Appraisal Report for Permit Number B010679 for detailed information about this timber sale.



Minnesota Department of Natural Resources
Division of Forestry - Timber Sales Program
TIMBER AUCTION - SEALED BID FORM

Submit bid to:

Timber Program Forester
DNR Forestry - Northwest Region
6603 Bemidji Avenue North
Bemidji, MN 55601-8669

Forestry Area Bemidji Area	
Bid Submission Deadline 1:00 PM on November 24, 2008	
Auction Type Regular Auction	
Tract Number B10-A	Permit Number B010679-A



The resource management of the Minnesota DNR's state forests and wildlife management areas meets the objectives of the SFI® program (Certificate No. 6Y921-S1) and the principles of the FSC® certification standard (Certificate No. SCS-FM/COC-088N).



Each bidder must fill out the Percent Bid-Up, Name, Address, etc. information below and must sign the form. Each bid must be submitted in a separate envelope, marked with the tract number (B10-A) and bidder's name, to the above address prior to the bid submission deadline (Monday, November 24, 2008 at 1:00 PM). On intermediate auctions, a bidder is limited to the purchase of no more than 25% of the tracts offered on the first round of bidding.

Percent Bid-Up is the percent bid above the appraised unit price(s). For example, a Percent Bid-Up of 50% on a Species/Product with a Unit Price of \$10.00 is calculated as follows: 1.50 multiplied by \$10.00 equals \$15.00 per cord. The Percent Bid-Up will be applied to all Species/Products listed with a plus symbol (+) in the Bid Species column. Bid unit prices will be rounded to the nearest whole cent.

The successful bidder must remit an advance payment of **\$504.45** (fifteen percent of the total appraised value) within ten (10) business days of the bid submission deadline (November 24, 2008). Failure to do so will result in forfeiture of the permit while still being liable to the State for the advance payment. Forfeited permits may be immediately awarded to the next highest eligible bidder.

My bid for the Species/Products listed
on the next page for this tract is:

Percent Bid-Up
(1% increments only)

%

This version of the tract has
reduced minimum bid prices.

Important: You must also submit a completed Sealed Bid Form on Tract Number B10 for this bid to be valid.

Please answer the following two questions to the best of your ability assuming you are the successful bidder. Individual responses will be kept confidential and will not be shared with other bidders. **You must answer both questions in order for your bid to be valid.**

1. When do you expect to harvest this tract? _____ years from now
2. For the timber offered for sale on this tract, how do you expect average stumpage prices to change by the time you harvest this tract (identified in Question #1)?

Please check one, and where applicable, indicate a percent change in stumpage prices.

☐ Decrease by _____ % ☐ No change ☐ Increase by _____ %

Name in which permit will be issued (PRINT or TYPE)

Title

Address (Complete Business Address)

Telephone Number (for notification purposes)

Authorized signature (IN INK)



Minnesota Department of Natural Resources
Division of Forestry - Timber Sales Program
TIMBER AUCTION - SEALED BID FORM

Page 2 of 2

Forestry Area Bemidji Area	
Bid Submission Deadline 1:00 PM on November 24, 2008	
Auction Type Regular Auction	
Tract Number B10-A	Permit Number B010679-A

Permit Expiration Date 11/24/2011

Species/Product List:

SOAV *	Species/Product	Appraised Quantity	Unit	Unit Price	Appraised Value	Bid Species +
	Trembling Aspen/Woodsrn Cordwood	250.00	Cd	\$ 9.00	\$ 2,250.00	+
	Red Oak/Woodsrn Cordwood	85.00	Cd	\$ 6.60	\$ 561.00	+
	Norway Pine/Woodsrn Cordwood	55.00	Cd	\$ 7.50	\$ 412.50	+
	Northern Hardwoods/Woodsrn Cordwood	45.00	Cd	\$ 3.10	\$ 139.50	+
Total Appraised Value					\$ 3,363.00	

See the Timber Appraisal Report for Permit Number B010679-A for detailed information about this timber sale.

**Appendix D. Questionnaire to Purchasers of DNR Stumpage
in MN, MI, and WI.**

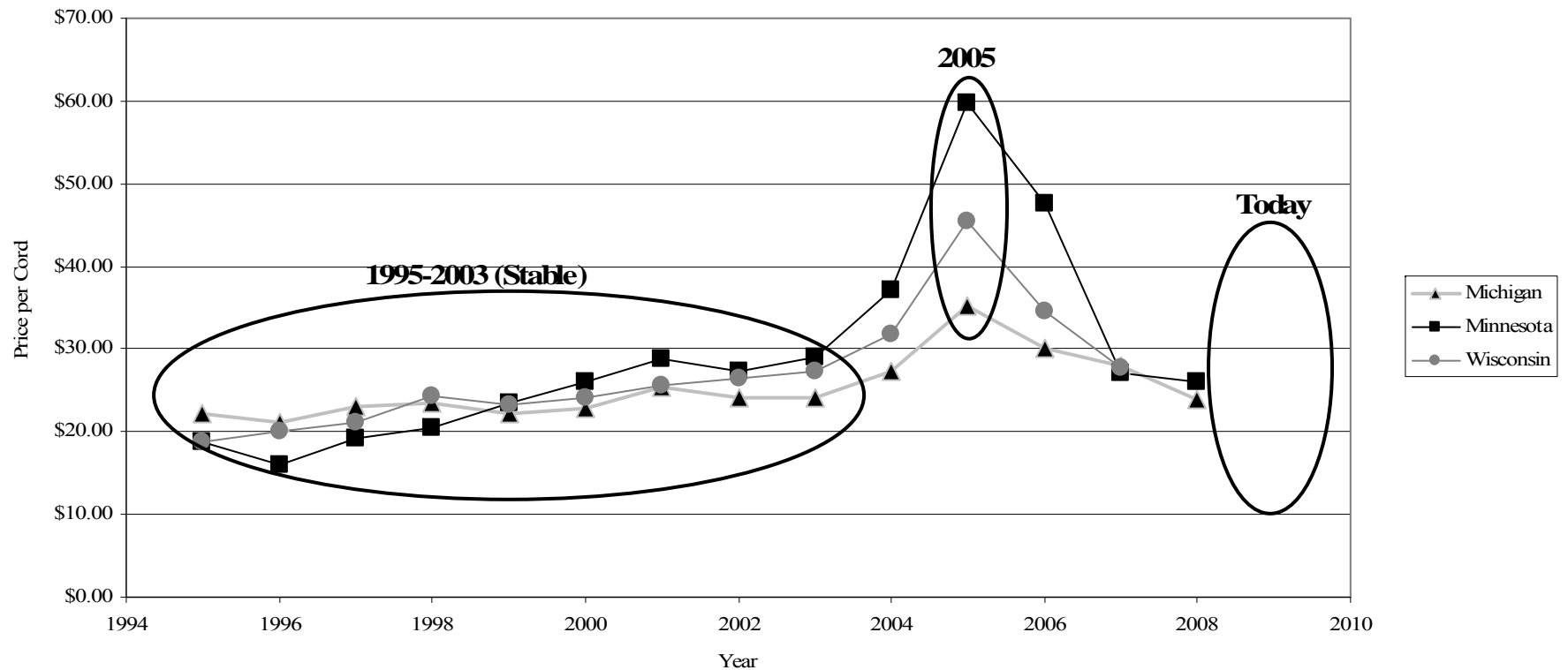
Identifying Factors Influencing Bids for DNR Stumpage

The purpose of this questionnaire is to identify how different factors influence your bidding practices and the price you paid for stumpage sold by your state's Department of Natural Resources (DNR), and how DNR foresters may consider those factors when designing timber sales. Several of these questions ask for your responses at three different points in time, as defined below.

- **TODAY** (characterized by depressed markets)
- **In 2005** (when timber sale stumpage prices were at historic highs)
- **During “Stable” Business Conditions** (the relatively stable business environment seen between 1995 and 2003).

The following graph displays aspen stumpage prices between 1995 and 2008.

Aspen Pulpwood Prices in the Lake States



1. From your perspective, indicate how frequently state DNR timber sales have the following characteristics. Please provide this perspective at the following three points in time: today, in 2005, and during stable business years (1995-2003). (1 = Characteristic has very low frequency, 5 = Characteristic has very high frequency)

	-----Today-----					-----2005-----					---Stable Conditions---				
	Very Low				Very High	Very Low				Very High	Very Low				Very High
The frequency of state DNR timber sales that:															
A. Have contracts exceeding 4 years	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
B. Contain high total timber volume.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

C. Have summer logging access.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
D. Contain a substantial volume of high quality wood....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
E. Are close to the markets for my timber	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Contain only species I have markets for.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
G. Incorporate many restrictive timber sale regulations..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
H. Require considerable road development.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
I. Require me to secure access across private property. .	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
J. Are likely to have low bidding competition.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
K. Require a substantial bid guarantee/down payment....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L. Are sold using a sealed bid auction format	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M. Are close to other timber sales I've purchased	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

2. **Indicate the importance you think state DNR foresters place on the following factors when setting up a timber sale. Please provide this perspective at the following three points in time: today, in 2005, and during stable business years (1995-2003).**
(1 = Factor is not important, 5 = Factor is very important)

	-----Today-----					-----2005-----					---Stable Conditions---				
	Not Important			Very Important		Not Important			Very Important		Not Important			Very Important	
The importance state DNR foresters place on timber sales that:															
A. Have contracts exceeding 4 years	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
B. Contain high total timber volume.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
C. Have summer logging access	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
D. Contain suitable levels of high quality wood.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
E. Are close to timber markets.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Contain only species I have markets for.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
G. Incorporate many restrictive timber sale regulations..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
H. Require considerable road development.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
I. Require me to secure access across private property ..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
J. Are likely to have low bidding competition.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
K. Require a substantial bid guarantee/down payment....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L. Are sold using a sealed bid auction format	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M. Are close to other timber sales I've purchased	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

3. From your perspective, indicate how important each of the following factors is to you when bidding on state DNR timber sales. Please provide this perspective at the following three points in time: today, in 2005, and during stable business years (1995-2003). (1 = Factor is not important, 5 = Factor is very important)

	-----Today-----					-----2005-----					---Stable Conditions---				
	Not Important			Very Important		Not Important			Very Important		Not Important			Very Important	
The importance of each factor on my bidding practices at state DNR timber sales:															
A. Have contracts exceeding 4 years	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
B. Contain high total timber volume.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
C. Have summer logging access	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
D. Contain suitable levels of high quality wood.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
E. Are close to the markets for my timber	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Contain only species I have markets for.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
G. Incorporate many restrictive timber sale regulations..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
H. Require considerable road development.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
I. Require me to secure access across private property ..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
J. Are likely to have low bidding competition.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
K. Require a substantial bid guarantee/down payment....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L. Are sold using a sealed bid auction format	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M. Are close to other timber sales I've purchased	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
N. My existing timber sale contract inventory.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
O. My expectations of future stumpage prices	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
P. Which forester appraised the timber sale.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Q. Which forester will supervise the timber sale.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

4. Write the letter of the three most important factors from question 3 above that you consider when preparing a bid for stumpage today.

_____ Most important

_____ Second most important

_____ Third most important

5. If you could design a state DNR timber sale that best meets the needs of your business, it would be as follows:

A. Size of the timber sale....._____ acres

B. Volume of the timber sale....._____ cords (or cord equivalents)

C. Number of different product markets for my timber....._____ markets

D. Length of timber sale contract....._____ years

E. Method of timber sale auction (check one): _____ sealed bid auction _____ oral bid auction

G. Method of payment for stumpage (check one): _____ consumer scale _____ lump sum

6. Please indicate how strongly you agree with the following statements about the method of auction:

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
Sealed bid auctions result in higher prices paid for stumpage overall than oral auctions	1	2	3	4	5
Sealed bid auctions make it harder to achieve my ideal inventory of timber sales	1	2	3	4	5
Sealed bid auctions create less bidding frenzy than oral auctions	1	2	3	4	5
Sealed bid auctions force me to spend more time preparing a bid than oral auctions	1	2	3	4	5
Sealed bid auctions decrease competition	1	2	3	4	5
Sealed bid auctions force me to leave more money on the table than oral auctions (larger gap between winning bid and second highest bid)	1	2	3	4	5

7. Please indicate how strongly you agree with the following statements about the consumer scale and lump sum methods of payment:

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
Lump sum sales require more of my effort when preparing a bid than consumer scale sales	1	2	3	4	5
Lump sum sales are more financially risky to me than consumer scale sales	1	2	3	4	5
Lump sum sales are typically less competitive than consumer scale sales	1	2	3	4	5

Tell Us About Your Business in 2008

8. I was (check only ONE which best describes your business):

- ☐ a logger
☐ employed by a wood products manufacturing company
☐ a wood broker
☐ other (please describe): _____

9. How many years had you been in the logging or wood buying business in 2008?

_____ Years

10. What percent of your state DNR timber contracts were purchased through a sealed bid auction format in 2008?

_____ 0-20% _____ 21-40% _____ 41-60% _____ 61-80% _____ 81-100%

11. What percent of your state DNR timber contracts were sold lump sum in 2008?

_____ 0-20% _____ 21-40% _____ 41-60% _____ 61-80% _____ 81-100%

12. Including yourself, how many full-time employees did your business have in 2008 (include your in-woods, trucking, and office employees)?

_____ Employees (winter season) _____ Employees (other times of the year)

13. How many different markets (contracts with different forest products companies) did you have for the wood you harvested from state DNR lands in 2008?

_____ Markets

14. What was the approximate volume of stumpage you purchased from the state DNR lands in 2008?

_____ Cords (or cord equivalents)

15. Indicate the percent of each product type you harvested from state DNR lands in 2008:

_____ % Pulpwood

_____ % Sawtimber

_____ % Biomass/Energy

_____ % Other (please describe): _____

Total: 100 %

16. Indicate the percent of stumpage you harvested from the following sources in 2008:

_____ % Federal

_____ % State DNR

_____ % County/Municipal

_____ % Family forest

_____ % Industrial

_____ % American Indian

_____ % Other (please describe): _____

Total: 100 %

17. Please provide any other comments you have about state DNR timber sale policies and procedures.

Thank you for taking time to review the survey!
Please return your completed survey in the self-addressed stamped envelope by August 14, 2009.

If you have any questions, comments or concerns please contact
Cass Pfender
Research Assistant
University of Minnesota
Department of Forest Resources
115 Green Hall
1530 Cleveland Ave North
St. Paul, MN 55108-6112
pfend005@umn.edu
612-624-1224

If you are interested in the results of the study, please check here: ☐

Appendix E. Questionnaire to DNR Foresters in MN, MI, and WI.

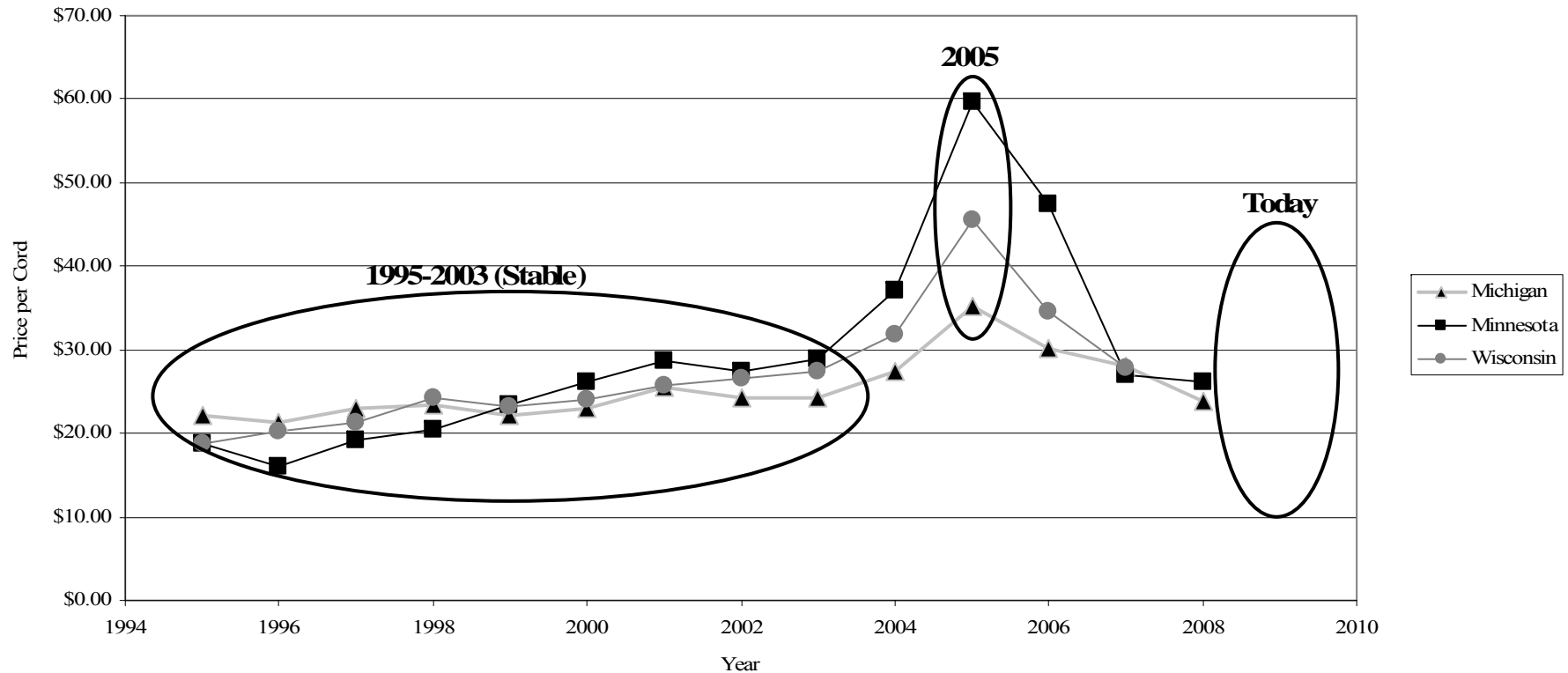
Identifying Factors Considered by DNR Foresters When Setting Up Timber Sales

The purpose of this questionnaire is to gather information on how different factors influence the bidding practices of and prices paid by loggers for stumpage sold by your agency, and how DNR foresters may consider those factors when setting up timber sales. Several of these questions ask for your responses at three different points in time as defined below:

- **TODAY** (characterized by depressed business and economic conditions)
- **In 2005** (when timber sale stumpage prices were at historic highs)
- **During “Stable” Business Conditions** (the relatively stable business environment seen between 1995 and 2003).

The following graph displays aspen stumpage prices between 1995 and 2008.

Aspen Pulpwood Prices in the Lake States



1. From your perspective, indicate how frequently your timber sales have the following characteristics. Please provide this perspective at the following three points in time: today, in 2005, and during stable business years (1995-2003).
(1 = Characteristic has very low frequency, 5 = Characteristic has very high frequency)

		-----Today-----					-----2005-----					---Stable Conditions---				
		Very Low		Very High			Very Low		Very High			Very Low		Very High		
The frequency of your state DNR timber sales that:																
A.	Have contracts exceeding 4 years.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
B.	Contain high total timber volume.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
C.	Have summer logging access.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
D.	Contain a substantial volume of high quality wood..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
E.	Are close to timber markets.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F.	Contain only species for which markets are readily available.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
G.	Incorporate many restrictive timber sale regulations	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
H.	Require considerable road development.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
I.	Require loggers to secure access across private property.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
J.	Are likely to have low bidding competition.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
K.	Require a substantial bid guarantee/down payment.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L.	Are sold using a sealed bid auction format.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M.	Are close to other timber sales in the area.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

2. Indicate the importance you place on the following factors when setting up a timber sale. Please provide this perspective at the following three points in time: today, in 2005, and during stable business years (1995-2003).
(1 = Factor is not important, 5 = Factor is very important)

	-----Today-----					-----2005-----					---Stable Conditions---				
	Not Important			Very Important		Not Important			Very Important		Not Important			Very Important	
The importance you place on timber sales that:															
A. Have contracts exceeding 4 years.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
B. Contain high total timber volume.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
C. Have summer logging access.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
D. Contain a substantial volume of high quality wood..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
E. Are close to timber markets.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Contain only species for which markets are readily available.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
G. Incorporate many restrictive timber sale regulations.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
H. Require considerable road development.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
I. Require loggers to secure access across private property.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
J. Are likely to have low bidding competition.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
K. Require a substantial bid guarantee/down payment.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L. Are sold using a sealed bid auction format.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M. Are close to other timber sales in the area.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

3. From your perspective, indicate how important each of the following factors is to loggers when bidding on state DNR timber sales. Please provide this perspective at the following three points in time: today, in 2005, and during stable business years (1995-2003). (1 = Factor is not important, 5 = Factor is very important)

	-----Today-----					-----2005-----					---Stable Conditions---				
	Not Important			Very Important		Not Important			Very Important		Not Important			Very Important	
The importance of each factor on loggers' bidding practices at state DNR timber sales:															
A. Have contracts exceeding 4 years.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
B. Contain high total timber volume.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
C. Have summer logging access.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
D. Contain a substantial volume of high quality wood..	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
E. Are close to timber markets.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
F. Contain only species loggers have markets for.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
G. Incorporate many restrictive timber sale regulations.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
H. Require considerable road development.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
I. Require loggers to secure access across private property.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
J. Are likely to have low bidding competition.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
K. Require a substantial bid guarantee/down payment.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
L. Are sold using a sealed bid auction format.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
M. Proximity to other timber sales they own.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
N. Their existing timber sale contract inventory.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
O. Their expectation of future stumpage prices.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
P. Which forester appraised the timber sale.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Q. Which forester will supervise the timber sale.....	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

4. Write the letter of the three most important factors from question 3 above that you think loggers consider when preparing stumpage bids today.

_____ Most important

_____ Second most important

_____ Third most important

5. If you could design a state DNR timber sale that best meets the needs of loggers, it would be as follows:

- A. Size of the timber sale....._____ acres
- B. Volume of the timber sale....._____ cords (or cord equivalents)
- C. Number of different product markets for the timber....._____ markets
- D. Length of timber sale contract....._____ years
- E. Method of timber sale auction (check one): _____sealed bid auction _____oral bid auction
- G. Method of payment for stumpage (check one) _____consumer scale _____sold on appraised volume (SOAV) estimate

6. Please indicate how strongly you agree with the following statements about the method of auction:

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
Sealed bid auctions result in higher prices paid for stumpage overall than oral auctions	1	2	3	4	5
Sealed bid auctions make it tougher for loggers to achieve their ideal inventory of timber sales	1	2	3	4	5
Sealed bid auctions create less bidding frenzy than oral auctions	1	2	3	4	5
Sealed bid auctions force loggers to spend more time preparing a bid than oral auctions	1	2	3	4	5
Sealed bid auctions decrease competition	1	2	3	4	5
Sealed bid auctions cause loggers to leave more money on the table than oral auctions (larger gap between winning and second highest bid)	1	2	3	4	5

7. Please indicate how strongly you agree with the following statements about the consumer scale and sold on appraised volume (SOAV) estimate methods of payment:

Statement	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
SOAV sales require more of my effort when preparing a sale than consumer scale sales	1	2	3	4	5
SOAV sales pose a greater financial risk to the DNR than consumer scale sales	1	2	3	4	5
SOAV sales are typically less competitive than consumer scale sales	1	2	3	4	5
SOAV sales are less costly for me to oversee than consumer scale sales	1	2	3	4	5
SOAV sales are less certain to achieve management objectives than consumer scale sales	1	2	3	4	5

Tell Us About Your Job with the DNR in 2008

8. I was (check only ONE which best describes your position):

_____ a forestry technician
_____ a field forester
_____ other (please describe): _____

9. How many years had you been with the DNR in 2008?

_____ years

10. What percent of the timber sales you helped set up and/or administer in 2008 were offered through a sealed bid auction format?

_____ 0-20% _____ 21-40% _____ 41-60% _____ 61-80% _____ 81-100%

11. What percent of state DNR timber sales you helped set up and/or administer in 2008 were sold on appraised volume (SOAV) estimate?

_____ 0-20% _____ 21-40% _____ 41-60% _____ 61-80% _____ 81-100%

12. How many timber sales did you set up and/or administer in 2008?

_____ timber sales

13. Please provide any other comments you have about how state DNR timber sale policies and procedures influence the bidding practices of and prices paid by loggers for stumpage.

Thank you for taking time to fill out the survey!

Please return your completed survey in the self-addressed stamped envelope by August 14, 2009.

If you are interested in the results of the study, please check here: ☐